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Noxious Weed Trust Fund

Programmatic Environmental Impact Statement

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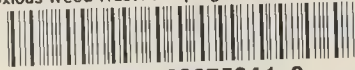
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DEPARTMENT OF AGRICULTURE

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CAPITOL STATION

HELENA, MONTANA 59620-0201

TELEPHONE:
AREA CODE 406
444-3144

FAX 406-444 5409

EVERETT M. SNORTLAND
DIRECTOR

STAN STEPHENS
GOVERNOR

December 9, 1991

TO: All Interested Parties

FR: Everett Snortland, Director *Everett*

RE: Draft Programmatic EIS - Montana Noxious Weed Trust Fund Program

In 1990 the Montana Department of Agriculture initiated a Draft Programmatic Environmental Impact Statement on the Montana Noxious Weed Trust Fund grants program. This document is enclosed for your review. Your suggestions and comments are encouraged.

Comments must be received by the Department no later than January 22, 1992 for consideration in the final PEIS. Public hearings are scheduled for January 10, 1992, Scott/Hart Auditorium, Helena, starting at 10 AM and January 13, 1992, Ramada Inn, Billings, starting at 1 PM.

Written comments should be addressed to:

Weeds DPEIS

Montana Department of Agriculture

Agricultural & Biological Sciences Div.

Capitol Station

Helena, Montana 59620-0205

Thank you for your interest and assistance in determining the future on the Montana noxious weed grant program.

Enclosure



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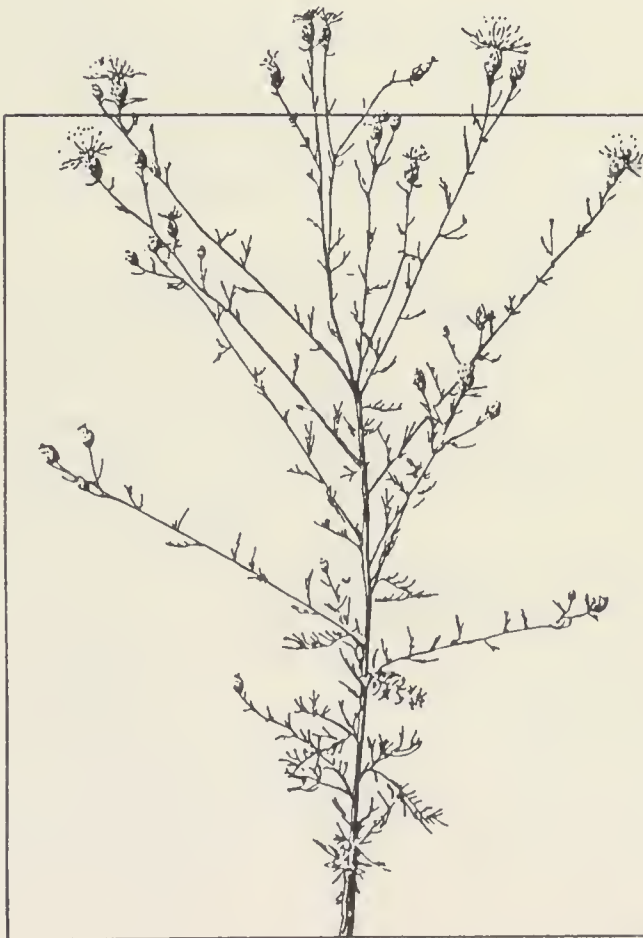
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Noxious Weed Trust Fund

Programmatic Environmental Impact Statement

**Montana Department of Agriculture
Agricultural and Biological Sciences Division**



December 1991

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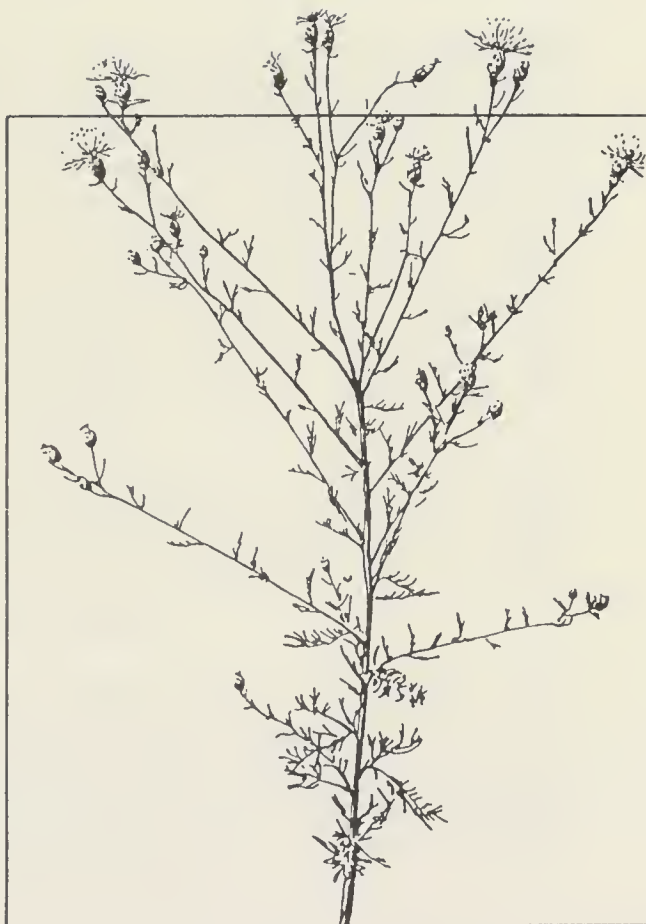
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ACRONYMS

ABSD	Agricultural and Biological Sciences Division (MDA)
ADI	Acceptable Daily Intake
AI	Active Ingredient
AMSL	Above Mean Sea Level
APHIS	Animal Plant Health Inspection Service
ARM	Administrative Rules of Montana
ARS	Agricultural Research Service
BC	Bureau of the Census
BEA	Bureau of Economic Analysis
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BMP	Best Management Practice
BPA	Bonneville Power Administration
CAST	Council for Agricultural Science Technology
CDA	Control Droplet Applicator
CEC	Cation Exchange Capacity
CECRA	Comprehensive Environmental Cost Recovery Act
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CES	County Extension Service
CFS	Cubic Feet Per Second
CNWCA	County Noxious Weed Control Act
CRP	Conservation Reserve Program
DOE	U.S. Department of Energy
DSL	Department of State Lands (Montana)
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FS	Forest Service
FY	Fiscal Year
GNP	Glacier National Park
IWM	Integrated Weed Management
MACGPA	Montana Agricultural Chemical Ground Water Protection Act
MBOGC	Montana Board of Oil and Gas Conservation
MCA	Montana Codes Annotated
MDA	Montana Department of Agriculture
MDFWP	Montana Department of Fish, Wildlife, and Parks
MDHES	Montana Department of Health and Environmental Sciences
MDOT	Montana Department of Transportation
MEPA	Montana Environmental Policy Act
MWCA	Montana Weed Control Association
NOEL	No Observable Effect Level
NPA	National Planning Association
NRCC	National Research Council of Canada
NWTF	Noxious Weed Trust Fund
PEIS	Programmatic Environmental Impact Statement
PL	Public Law

SWCP	Southwestern Cooperative Weed Control Project
USC	United States Code
USDA	U.S. Department of Agriculture
USDC	U.S. Department of Commerce
USDI	U.S. Department of the Interior
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WSSA	Weed Science Society of America
YNP	Yellowstone National Park

INTRODUCTION



Chapter 1

Noxious Weed Trust Fund

Programmatic Environmental Impact Statement

CHAPTER 1

INTRODUCTION

BACKGROUND FOR THE PROGRAMMATIC EIS

The Montana Department of Agriculture (MDA) administers the Noxious Weed Trust Fund (NWTF) under the provisions of the Montana Noxious Weed Trust Fund Act of 1985 (Title 80-7-801 *et seq.*, Montana Codes Annotated (MCA)). The MDA collects funds from the herbicide sales surcharge (80-7-812, MCA), and a vehicle weed fee (61-3-510, MCA and 23-2-803, MCA) and allocates monies through grants or contract funds to communities, weed districts, or other entities it considers appropriate for noxious weed management projects. Appendix A contains the Montana Noxious Weed Trust Fund Act.

The MDA has determined that the grants program constitutes a major state action requiring the preparation of a Programmatic Environmental Impact Statement (PEIS) as dictated by the Montana Environmental Policy Act (MEPA) (Title 75-1-101, MCA) and rules (4.2.312-337 Administrative Rules of Montana (ARM)). Based on this decision, the MDA contracted with Chen-Northern, Inc. of Helena, Montana to prepare the Programmatic Environmental Impact Statement.

MEPA requires all state agencies to recognize and consider to the fullest extent possible the consequences that their actions may have on the quality of the human environment (75-1-201, MCA) and directs them to:

- ◆ utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decision making which may have an impact on man's environment; and
 - ◆ identify and develop methods and procedures which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decision making along with economic and technical considerations.
- A "programmatic review" is a MEPA document that is defined as a "general analysis of related agency-initiated actions, programs or policies, or the continuance of a broad policy or program" that may "in part or in total...constitute a major state action significantly affecting the quality of the human environment" (4.2.328, ARM). Programmatic reviews must discuss the impacts associated with the agency action or program, alternative ways of conducting the action, and the cumulative environmental effects of the alternatives in relation to other programs of a similar nature. MEPA requires the MDA to:
- ◆ issue a Draft Programmatic Environmental Impact Statement;
 - ◆ encourage and accept public comments on the draft; and
 - ◆ Issue a Final PEIS. In accordance with the model MEPA rules adopted by MDA, the final PEIS may:
 - ▶ modify alternatives, including the preferred alternative;
 - ▶ develop and evaluate alternatives not previously given serious consideration;
 - ▶ supplement, improve, or modify the analysis contained in the draft;
 - ▶ make factual corrections; and,
 - ▶ explain why comments do not warrant further response.

This document describes the NWTF grants program as currently administered, the existing environment and resources the program affects, and the direct, indirect, and cumulative impacts the program has on the natural and human environment. This PEIS will assist the MDA in planning and decision-making by presenting an integrated and interdisciplinary analysis of administrative alternatives for the NWTF program. Analysis of impacts in this document is based on literature research, past programs, interviews with project participants, and public concerns.

A 45-day public comment period will follow publication of the Draft PEIS. Public hearings may be held during this period by the MDA. After all comments are addressed, a Final PEIS will be produced. The MDA will make a decision on the future administration of the grants program after publication of the Final PEIS. The department can make a decision no sooner than 15 days following publication.

PERCEPTIONS OF NWTF PROGRAM

The MDA prepared a scoping document to seek public input on the existing NWTF grants program (Appendix B). Copies of this document were mailed during March, 1990 to an estimated 300 individuals, agencies, and organizations including county weed supervisors, NWTF advisory council members, grant participants, agricultural scientists and conservation groups. Thirty-nine individuals and/or organizations responded with written comments while 33 persons presented oral testimony at four public meetings to help determine the scope of the PEIS and voice their concerns over administration of the NWTF program.

Various opinions and concerns were expressed during the scoping process by people who were familiar with the NWTF program, but there was no general consensus among commenters. Some commenters thought that the proposed PEIS was not needed or would be too costly to prepare, while almost an equal number believed that the PEIS was necessary to establish control measures for the NWTF program. Others seemed confused by the PEIS, commenting that they saw no need

for an EIS to be prepared for each grant proposal. The role of a PEIS for MEPA compliance was apparently not understood by many commenters even though they were familiar with the NWTF program.

Some individuals indicated that the program should not change, while others believed a monitoring program or environmental review process should be established. Some thought there should be more funding for weed control research, research on the effects of chemical weed control treatment, and investigation of biological control, whereas others stated there should be no money spent for weed control research. Some individuals thought that those applying for grants should demonstrate a long-term commitment to controlling weeds and that proposed projects should be judged on scientific merit and relevance to solving weed problems, rather than on a person's affiliation with a particular group. Others expressed the view that the program should fund a few high-quality projects, rather than many mediocre projects. Some felt that criteria for acceptance of a proposed project should be consistent and unbiased. Many discussed the need for and appreciation of the NWTF program. Public input has helped the MDA focus on these and other issues related to the program.

In addition to scoping concerns, a survey of members of the NWTF advisory council and Montana Weed Control Association, county weed board supervisors, agricultural scientists, and former grant recipients was conducted by Chen-Northern, Inc. in April 1991. A questionnaire was sent out to approximately 75 people (Appendix B). Persons closely involved with the NWTF program generally agreed with the way it has been administered. Ninety-one percent of the 32 people interviewed believed that the NWTF program, as it is presently administered, is an effective mechanism for distributing monies for weed control in Montana. Most respondents (72%) approved of the current funding allocation for weed control, research, and education. Slightly fewer (69%) believed that the environmental information required is adequate to ensure protection of area resources.

The majority of those interviewed (75%) did not favor allocating additional monies to administer the NWTf program. Fifty-three percent expressed the view that monitoring or auditing to evaluate project results is important.

About 50% of the 32 respondents were of the opinion that the program should not be changed; however, many suggestions also were made to modify the program. Suggested changes included:

- ◆ Fund grants fully or not at all.
- ◆ Expand the program.
- ◆ Reduce paperwork and bureaucracy.
- ◆ Drop the 1% surcharge on herbicides.
- ◆ Distribute grants more evenly across the state.
- ◆ Provide justification for grant rejections.



Field bindweed

Problems were identified by those interviewed concerning interaction with the public. The most frequently expressed concern was that the public is poorly informed about noxious weeds and herbicides. These people attributed the widespread public perception that herbicides are harmful to human health and the environment to insufficient education. Other public concerns identified by the respondents were loss of non-target plants, effectiveness of weed control programs, and high cost of weed control.

OTHER LAWS AND REGULATIONS

Other state and federal agencies that have applicable and/or relevant laws and regulations regarding weed control or the environmental effects thereof include:

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

Federal Insecticide, Fungicide, and Rodenticide Act

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), administered by the EPA, provides for the registration of pesticides, certification of applicators to apply restricted use pesticides, and enforcement of pesticide regulations. FIFRA also provides for individual states to obtain primacy for enforcement of FIFRA regulations as long as the states' requirements are at least equal to federal requirements. Herbicides registered since 1982 are on a 5 year re-registration schedule. Those registered prior to 1982 are on a re-registration schedule based on their acute and chronic toxicity and other physical and chemical properties.

MONTANA DEPARTMENT OF AGRICULTURE

Montana Weed Control Act

The Montana Weed Control Act (80-7-701 *et seq.*, MCA) gives the Montana Department of Agriculture the authority to provide technical

assistance and services to local governments, agricultural producers and the general public on the management and control of noxious plants. This assistance and service may include information on the location of infested acreages and an assessment of the economic and environmental impacts on the state and its citizens as a result of these conditions. In addition, MDA makes information available on the proper use of herbicides and recommends where certain management tools should be utilized in order to avoid adverse economic or environmental impacts.

The Montana Weed Control Act also authorizes MDA to seek federal funds under 43 USC 1242 to implement management of noxious plants on federal lands in cooperation with any federal agency and the local government body responsible for noxious plant management.

Montana Pesticides Act

The Montana Department of Agriculture administers the Montana Pesticides Act (80-8-801 *et seq.*, MCA) which requires the registration of all pesticides manufactured, formulated, distributed, sold, or transported in the state. Commercial and government applicators must be licensed to apply pesticides and farm applicators must obtain special use permits for restricted use pesticides. In addition, pilots and aircraft involved with aerial application must be registered by the Montana Department of Commerce.

The State of Montana has primacy for enforcement of FIFRA under the Montana Pesticides Act.

County Noxious Weed Control Act

The County Noxious Weed Control Act (CNWCA) (7-22-2101 *et seq.*, MCA), which is contained in Appendix A, is administered at the county level. The Act states that it is unlawful for any person to allow noxious weeds to propagate or go to seed on his or her land and encourages landowners to file weed control plans. State law requires counties to develop weed control districts to plan and

implement weed control efforts. County commissioners appoint a district weed board that is responsible for administration and enforcement of the district's noxious weed program. The CNWCA provides for the promulgation of rules to list statewide noxious weeds and allows for county-wide listing of additional species.

MONTANA DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES

Montana Water Quality Act

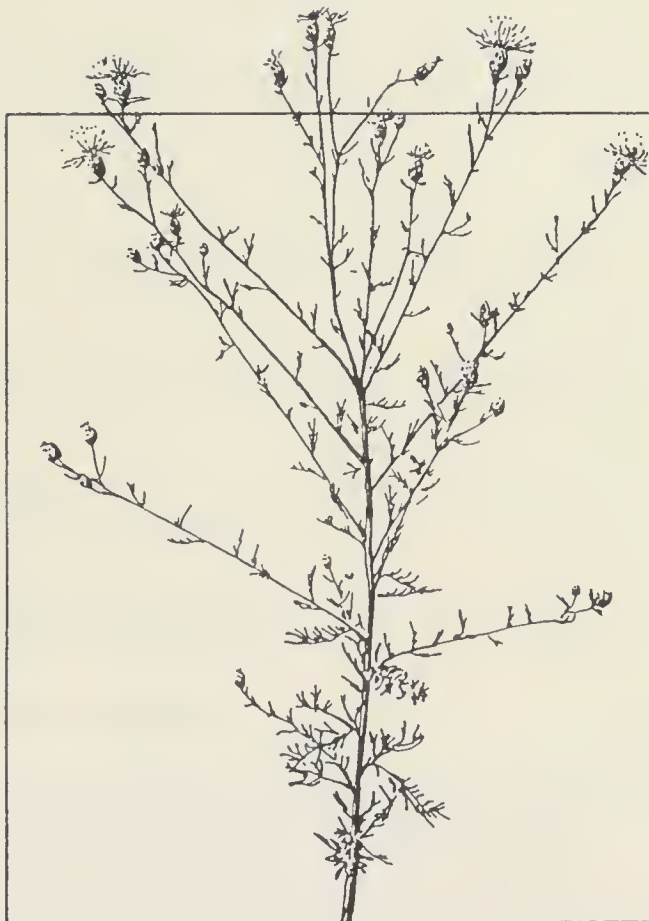
The Water Quality Bureau of the Montana Department of Health and Environmental Sciences (MDHES) is responsible for administration of the Montana Water Quality Act (75-5-101 *et seq.*, MCA). This law provides a framework for classification of surface and ground water, establishes surface and ground water quality standards, and provides for a permit program to control discharge of pollutants into state waters. State waters are required to be free of discharges that create toxic concentrations harmful to human, animal, plant, and aquatic life.

MDA AND MDHES

Montana Agricultural Chemical Ground Water Protection Act

The Montana Agricultural Chemical Ground Water Protection Act (MACGPA) (80-15-100 *et seq.*, MCA), was adopted by the 1989 legislature and implemented on January 1, 1990. Administered jointly by the MDA and the MDHES, the act charges MDA with development of agricultural chemical ground water plans and monitoring programs and MDHES with adoption of ground water quality standards and ground water monitoring requirements. Each agency administers enforcement provisions under the Act. The MDA rules were implemented December, 1990, and the MDHES will complete its portion of the rule-writing process sometime in 1991 or 1992.

HISTORY OF NOXIOUS WEEDS, WEED MANAGEMENT METHODS AND PROGRAMS



Chapter 2

Noxious Weed Trust Fund

Programmatic Environmental Impact Statement

CHAPTER 2

HISTORY OF NOXIOUS WEEDS, WEED MANAGEMENT METHODS AND PROGRAMS

ORIGIN AND HISTORY OF NOXIOUS WEEDS

Introduced plants often are aggressive colonizers following disturbance to native vegetation and soil. When these plants conflict, restrict, or otherwise interfere with land management objectives, they are commonly referred to as weeds. Weeds typically have reproductive, morphological, and physiological attributes that allow them to effectively compete for growing space. Most weeds have several of the following characteristics:

- ◆ Perennial in nature, reproducing by rhizomes, roots, and/or vegetative plant parts.
- ◆ Continuous seed production for as long as growing conditions permit.
- ◆ Effective ways of dispersing seed.
- ◆ Ability of seeds to remain dormant in the soil for long periods.
- ◆ Ability to grow under adverse environmental conditions.
- ◆ Adaptations to a wide variety of soil and climatic conditions.
- ◆ Ability to effectively compete for soil moisture, nutrients, and sunlight.
- ◆ Genetic adaptability.

Once a plant has been classified as a weed, it only attains a "noxious" status by legislation (Lacey and Olson, in press). The County Noxious Weed Control Act Rules (Appendix A) currently designate 15 exotic plants as noxious weeds in

the state. These plants are divided into three categories based on the amount of acreage infested and potential for invasion. Table 2-1 lists each noxious weed by category, origin, date of introduction, life form, reproduction, habitat, and affected acreage.

Category 1 weeds are currently established and generally widespread. Spotted knapweed, leafy spurge, Canada thistle, St. Johnswort, and field bindweed are the Category 1 weeds currently affecting the largest acreage. The remaining Category 1 weeds--diffuse knapweed, Russian knapweed, Dalmatian toadflax, and whitetop--affect much smaller acreage but are rapidly spreading.

Category 2 weeds have recently been introduced to the state or are rapidly spreading. Noxious weeds included in this category are dyers woad, purple loosestrife, and sulfur cinquefoil. With the exception of sulfur cinquefoil, these weeds currently affect relatively small tracts of land in the state; for instance, dyers woad infested approximately 125 acres in 1987 and purple loosestrife is found in approximately five locations with less than 200 total acres.

Category 3 weeds have not yet been detected in the state or are found only in scattered, localized infestations. This category includes yellow starthistle, common crupina, and rush skeleton-weed. Yellow starthistle and rush skeletonweed have been reported in Montana. Currently, common crupina and rush skeletonweed are found in Idaho, Washington, and Oregon. Rush skeletonweed is also found in California.

Noxious weeds were brought into this country from Europe and Eurasia during colonization and early settlement. They were either introduced intentionally for their perceived value to man, such

TABLE 2-1 LIST OF MONTANA NOXIOUS WEEDS

Category 1	Family	Origin	Date of Introduction	Life Form	Reproduction	Habitat	Other	Acreage Affected
Leafy spurge (<i>Euphorbia esula</i>)	Spurge	Eurasia	Brought to U.S. in 1827 ⁽¹⁾ ; Intro. to Montana in 1917 as hay seed from N. Dakota ⁽⁴⁾	Perennial forb	Root stalks; seed	Dry upland sites; moist areas; shallow rocky soils	Explosive seed capsules, milky sap; seeds viable for 8 years ⁽¹⁾	500,618 ⁽²⁾
Canada thistle (<i>Cirsium arvense</i>)	Sunflower	Eurasia	Intro. to Canada late 19th Century ⁽¹⁾ ; noted in Montana in 1901 ⁽⁵⁾	Perennial forb	Root stalks; seed	Disturbed sites; pastures; meadows	Extensive horizontal roots; male & female flowers	1,879,106 ⁽²⁾
Whitetop (<i>Cardaria draba</i>)	Mustard	Europe	Reported in Montana in 1931 ⁽¹⁰⁾	Perennial forb	Root stalks; seed		Deep rooted	56,301 ⁽²⁾
Field bindweed (<i>Convolvulus arvensis</i>)	Morning glory	Europe	Noted in Montana in 1901 publication ⁽³⁾	Perennial forb	Root stalks; seed	Disturbed sites; cultivated fields	Taproot up to 60 feet long; seeds viable for 50 years ⁽¹⁾	668,772 ⁽²⁾
Russian knapweed (<i>Centaurea repens</i>)	Sunflower	Eurasia	Intro. to North America 1898 ⁽¹⁾ ; Reported in Montana in 1931 ⁽¹⁰⁾	Perennial forb	Root stalks; seed	Irrigated and dryland pasture; range; hayland; cropland	Horses develop nervous disorders when plant is grazed	47,893 ⁽²⁾
Spotted knapweed (<i>Centaurea maculosa</i>)	Sunflower	Eurasia	1920's ⁽²⁾ - alfalfa & clover seed contaminant	Biennial/perennial forb	Seed	Disturbed sites; pastures; rangelands; hayland		4,721,060 ⁽²⁾
Diffuse knapweed (<i>Centaurea diffusa</i>)	Sunflower	Eurasia	Intro. with spotted knapweed ⁽²⁾	Annual/perennial/biennial forb	Seed	Disturbed areas; rangeland; pastures; hayland		10,349 ⁽²⁾
Dalmatian toadflax (<i>Linaria damatica</i>)	Dracopis	Europe	Reported in Montana in 1951 ⁽¹⁰⁾	Perennial forb	Root stalks; seed	Disturbed areas; rangeland	Deep root system; many leaves	56,750 ⁽²⁾
St. Johnswort (<i>Hypericum perforatum</i>)	St. Johnswort	Europe	Reported in Montana by 1910 ⁽¹⁰⁾	Perennial forb	Root stalks; stolon; seed	Meadows; dry sandy or gravelly soils; disturbed sites; rangeland	Poisonous (photosensitization)	514,099 ⁽²⁾
Category 2	Family	Origin	Date of Introduction	Life Form	Reproduction	Habitat	Other	Acreage Affected
Dyers woad (<i>Isatis tinctoria</i>)	Mustard	Europe	Intro. to U.S. as source of dyes. Intro. to Utah in 1917 ⁽¹⁾ ; Reported in Montana in 1958 ⁽³⁾	Winter annual/biennial perennial forb	Seed; taproot	Disturbed areas; rangeland	Deep taproot	125 ⁽⁷⁾
Purple loosestrife (<i>Lythrum salicaria</i> & <i>L. virgatum</i>)	Loosestrife	Eurasia	Intro. to U.S. in early 1800's; first reported in Montana in 1907 ⁽⁶⁾	Perennial forb	Root stalks; seed	Floodplains; marsh edges; stream margins; seasonally flooded impoundments	Long lived	Only noted in Cascade, Missoula and Lake Counties
Sulfur cinquefoil (<i>Potentilla recta</i>)	Rose	Europe	Ravalli County - 1948 ⁽⁹⁾	Perennial forb	Seed	Dry fields, wastelands; pastures; meadows; rangeland	Troublesome in limestone regions	Unknown
Category 3	Family	Origin	Date of Introduction	Life Form	Reproduction	Habitat	Other	Acreage Affected
Yellow starthistle (<i>Centaurea solstitialis</i>)	Sunflower	Europe	Ravalli County - 1958 ⁽⁹⁾	Winter annual/perennial forb	Seed	Disturbed areas; rangeland	Causes chewing disease in horses (nervous disorder) ⁽¹¹⁾	Ravalli, Flathead, Gallatin and Liberty Counties
Common crupina (<i>Crupina vulgaris</i>)	Sunflower	Europe	Found in Idaho, Oregon and Washington only ⁽³⁾	Winter annual/perennial forb	Seed	Well drained, rocky to silt loam soil		-
Rush skeletonweed (<i>Chondrilla juncea</i>)	Sunflower	Eurasia	Currently in ID, WA, OR, CA ⁽¹⁾	Perennial	Root stalks; seed	Well drained, light textured soils; disturbed areas	Milky latex sap; extensive and deep root system	Sanders County

1 Whitson, T.D. 1987
2 Locken, L.J. 1985
3 Lacey, C.A. 1987a
4 Barreto, C.L. 1982
5 Blankenship, J.W. 1901

6 Brenneman, J.E. et al. 1988
7 Fay, P. 1987
8 Lacey, C.A. 1986
9 Rice, P. et al. In press
10 Forcella & Harvey 1980

as for livestock feed, dyes, or as ornamentals, or unintentionally as "stowaways" in seed, feed grain, hay, or ship ballast. Once established, they may spread rapidly by both natural (e.g., wind, water, and animals) and artificial means (e.g., transportation systems, farming equipment, and planting crops contaminated with weed seeds). Figure 2-1 shows the spread of eight noxious weeds in Montana between 1920 and 1980. Although weeds commonly invade disturbed or environmentally stressed land, some species have the ability to invade native vegetation in good and excellent condition (Tyser and Key 1988; Harris and Cranston 1979; Myers and Berube 1983). Once established, noxious weeds compete efficiently with native plants for nutrients, light, and moisture.

ENVIRONMENTAL EFFECTS

The invasion of noxious weeds on range and woodland sites has a profound impact on native plants. Spotted knapweed invasion into undisturbed grasslands in Glacier National Park was shown to decrease the number and frequency of native species (Tyser and Key 1988). Similar impacts on native plants caused by spotted knapweed have been reported in other areas in western Montana (Bedunah and Carpenter 1989; Lesica 1991). Leafy spurge, yellow starthistle, and dyers woad can also adversely affect native vegetation (Belcher and Wilson 1989; Maddox and Mayfield 1985; West and Farah 1989).

The influence of noxious weeds on rare native plant species and plant communities is currently being documented. Spotted knapweed is known to affect a number of rare plants in Montana, including sapphire rockcress and Howell's gumweed (Shelly 1986). Seedling establishment and fitness of sapphire rockcress was reported to decline with increasing competition from spotted knapweed (Lesica and Shelly 1991; Hamilton and Mitchell-Olds 1988). It is reported that the Nature Conservancy is concerned about the impact of spotted knapweed and sulfur cinquefoil on Spalding's catchfly (Hall, B. 1991). The largest known population of this threatened plant is located on the Tobacco Plains north of Eureka, Montana. Concern has also been expressed about the impact of spotted knapweed and sulfur cinquefoil on rare plant communities located near Hot Springs, Montana (Lesica 1991).

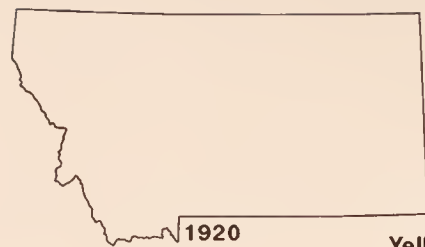
Noxious weeds are recognized as having a detrimental impact on wildlife, especially big game animals that utilize foothill and mountain slopes as critical winter range. A U.S. Forest Service report estimated that forage loss due to spotted knapweed invasion of big game winter range could cause a decline of 220 elk on the Lolo National Forest by the year 1998 (Spoon *et al.* 1983). In western Montana, elk use was considerably less on spotted knapweed-infested sites compared with bunchgrass sites (Bedunah and Carpenter 1989). Spotted knapweed was not detected in the diet of mule deer on winter range in Montana although it was a common plant on most sites (Guenther 1989).

Habitat for upland game birds and waterfowl is also threatened by noxious weeds. Spotted knapweed and sulfur cinquefoil are invading the bunchgrass ranges of northern Lincoln County that provide habitat for the Columbian sharp-tailed grouse. Grouse habitat is tied directly to the structure of the rough fescue community which would be seriously altered by invasion of these two noxious weeds (Hall, B. 1991). Purple loosestrife has been shown to degrade waterfowl habitat by replacing native food plants critical to ducks and geese (Friesen 1966; Thompson *et al.* 1987).

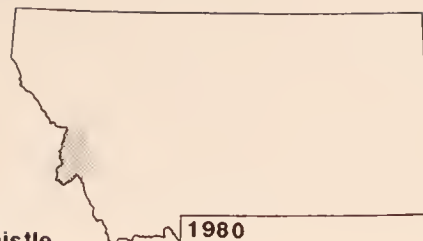
Noxious weeds may benefit some wildlife species. They provide cover, habitat, and a source of feed for many game and non-game birds (Weigand 1977). Small rodents also use the seeds as a food source (Lacey, C.A. personal observation).

Noxious weeds have been found to degrade water quality and increase soil erosion. A study conducted in western Montana compared surface runoff and sediment yield on spotted knapweed-infested sites with similar sites dominated by a native bunchgrass community. Surface runoff and sediment yield were reported to be 56% and 192% higher, respectively, on spotted knapweed sites compared with bluebunch wheatgrass sites (Lacey, J.R. *et al.* 1989). However, the ability of noxious weeds to rapidly establish disturbed sites may help to stabilize soil in areas devoid of native vegetation.

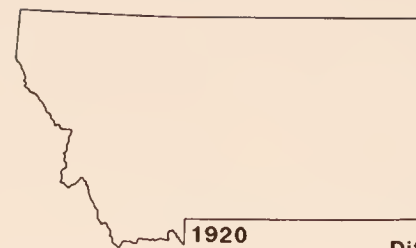
Noxious weeds are often considered to be detrimental to recreational activities and to the experience of recreational users. The presence of



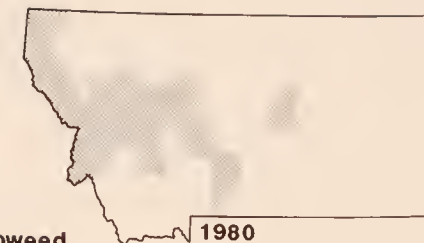
Yellow starthistle



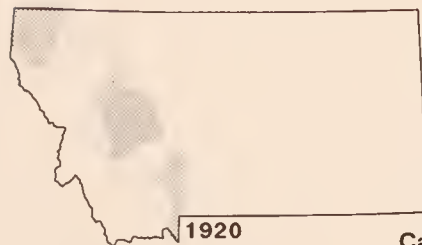
1980



Diffuse knapweed

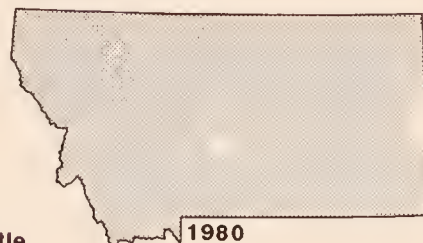


1980

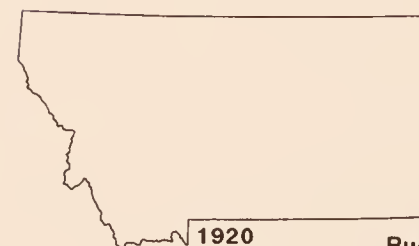


1920

Canada thistle

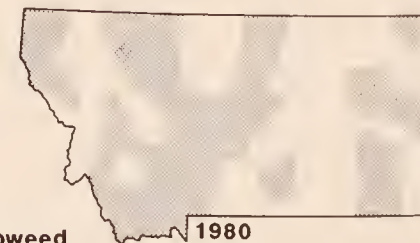


1980



1920

Russian knapweed



1980



1920

Dyers woad

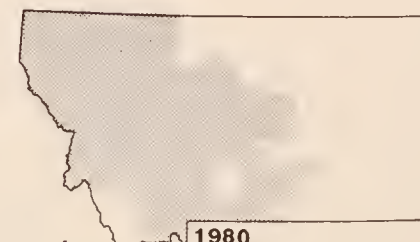


1980



1920

Spotted knapweed

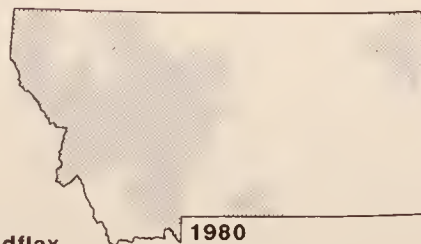


1980



1920

Dalmatian toadflax

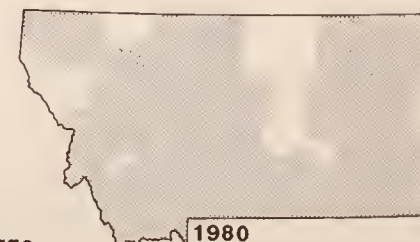


1980



1920

Leafy spurge



1980

**The Spread of Eight Montana Noxious Weeds, 1920-1980
NWTF-Programmatic EIS
FIGURE 2-1**

Source: Forcella and Harvey 1981

weeds in campgrounds, at boat launches, beaches, meadows, and riparian areas can detract from the desirability and usefulness of these sites. Weeds along trails can be unsightly and detract from the enjoyment of native vegetation. The stiff stalks, burrs, thorns, and saps of weeds can be barriers to some forms of recreation and can cause injury or allergies to recreational users.

The extent to which noxious weeds affect the visual resource is primarily a function of the public's perception of weeds and the physical attributes of specific weeds. Most weeds are visually significant only when seen in foreground viewing distance. Some weeds blend with the surrounding vegetation, or even add a diversity of color that does not detract from the vista. Others have physical characteristics (e.g., spreading or thorny stalks) that make them visually unpleasant. Some weeds detract from the visual experience not only by their form but by the environments that allow them to thrive, such as disturbed areas. Weeds can also detract from visual quality during winter when their bare stalks stand out from the surrounding landscape or by establishing a monoculture which can be visually undesirable.

ECONOMIC EFFECTS

Most economic impacts reported from noxious weeds on rangeland have been based on a reduction in livestock carrying capacity. Because of nutritional quality, season of growth, and palatability, most noxious range weeds have less forage value than the native plants they displace (Lacey and Olson, in press). French and Lacey (1983) calculated that spotted knapweed invasion costs Montana's range livestock industry approximately \$4.5 million annually in forage loss. If spotted knapweed infested all susceptible sites in the state, the potential annual loss could reach \$155 million (Bucher 1984). Similar reductions in forage may result from monocultures of other unpalatable noxious weeds, such as sulfur cinquefoil. The threat of spotted knapweed infesting additional acreage and reducing forage was considered in an economic evaluation of controlling the weed in western Montana (Griffith and Lacey 1991).

Leafy spurge also has been recognized as causing a serious economic impact in Montana. The weed can reduce cattle carrying capacity by 50% to 75% (Alley *et al.* 1984), resulting in an estimated forage loss to the cattle industry in Montana of \$1.5 million (Lacey *et al.* 1985). Reilly and Kaufman (1979) estimated that private landowners were spending more than \$2.5 million annually in an effort to control leafy spurge.

The presence of noxious weeds may also impact land values. Maddox (1979) reported that knapweed infestations reduced appraisal value of land in Oregon. In western Montana, however, the effect of noxious weeds is frequently not considered in land sales. Recent buyers are more interested in the scenic quality of the property (i.e., lakes, streams, mountains) than in the production capability of the land (Lacey and Olson, in press). However, in eastern Montana, the presence of leafy spurge on agricultural land greatly reduces land value and resale potential (Egan 1991).

WEED MANAGEMENT TECHNIQUES

Several different management techniques can be used to contain, control, or eradicate noxious weeds. These include the use of herbicides, cultural techniques (hand removal, cultivation, burning, reseeding), and biological methods (insects, pathogens, or grazing animals). An integrated weed management (IWM) approach involving the use of several control techniques is critical when managing extensive weed infestations that occupy a variety of ecological niches, such as riparian areas, foothills, and mountain slopes.

The weed control method or methods selected will depend on the following factors: control objectives; effectiveness of the control technique on a target species; environmental factors; land use; economics; and the extent and nature of the weed infestation (Lacey, in press). Various weed management techniques are described below.

CHEMICAL WEED MANAGEMENT

Chemical control of weeds dates to the days of the Roman Empire when ashes, salt, and inorganic wastes were used to control weeds on roadbeds. Before the turn of the century, copper sulfate was one of the first selective chemicals used to control broadleaf weeds, particularly mustards, in cereal crops. Stove oil was once widely used to control weeds in carrots because carrots could tolerate the oil, while the weeds could not. Millions of pounds of inorganic salts, such as sodium chlorate, have been used in the past to sterilize soils and control deep-rooted weeds in industrial areas (Ross and Lembi 1985). Most herbicides developed since 1945 are synthetic organic compounds. By 1950, about 15 basic herbicides existed. Today there are more than 750 active pesticide ingredients, and about 25,000 formulated products of which about two thirds are herbicides. (USEPA 1991). The effectiveness of various herbicides is based on pathways by which they enter the plant and biochemical actions within the plant. Entry into the plant, can be through direct contact with above-ground foliage or uptake through the root system.

Herbicides are also categorized as selective or non-selective for a particular type of plant. Selective herbicides kill a specific type of plant, such as a broadleaf weed, whereas non-selective herbicides kill both grasses and broadleaf vegetation.

Herbicides that include the active ingredients picloram, dicamba, 2,4-D, clopyralid, and glyphosate are commonly recommended for noxious weed control in Montana (see Table 6-1, Chapter 6). In addition to active ingredients, herbicide formulations also include inert materials, such as carriers and surfactants. With the exception of glyphosate, the active ingredients listed above are auxin-type compounds that are selective for broadleaf plants, allowing grasses to continue to grow. A description of the different herbicides commonly used for noxious weed control on range and pastureland follows. More specific information can be found in Chapter 6.

- ◆ Picloram, sold under the trade name Tordon 22K, is a restricted-use pesticide and can only

be purchased and applied by certified applicators. It is labeled for small grain, forestlands, rangelands, rights-of-way, and roadside weed control. Picloram is absorbed both through leaves and roots and transported upward and downward within the plant. Symptoms of the herbicide on sensitive plants includes twisting and cupping of stems and leaves. Picloram is adsorbed to both clay and organic matter; however, leaching may occur in sandy soils low in organic matter. Picloram is degraded by soil microorganisms and ultraviolet light. The length of time picloram residues remain in the soil varies according to geographic location, climatic conditions, and rate of application. Degradation is more rapid under warm, humid conditions and in soils high in organic matter (Colby *et al.* 1989). The use of picloram is restricted on soils with rapid to very rapid permeability and a shallow water table.

- ◆ Dicamba is sold under the trade name of Banvel. It is readily absorbed by leaves and roots and easily transported within the plant. Residues of dicamba from treated plants can dissipate by exudation through the roots into the surrounding soil, and by metabolism within the plant and loss from leaf surfaces. Grass damage may occur with high rates of application. Dicamba is mobile in soil and may leach in coarse-textured soils. Dicamba is degraded by microorganisms; however, it will persist for several months in the soil. As with picloram, the length of time dicamba will persist in the soil is dependent on temperature, moisture, soil characteristics, and herbicide application rate.
- ◆ 2,4-D is an active ingredient in many products sold for large-scale weed control and for ornamental and turf use. It is absorbed by leaves, stems, and roots, and transported throughout the plant in the phloem and xylem. The herbicide accumulates in the growing points of shoots and roots. Salts of 2,4-D are more

soluble than other formations and can move in some soils (Colby *et al.* 1989). 2,4-D is less persistent than picloram, dicamba, or clopyralid, and some formulations can be used closer to water. The ester formulations of 2,4-D are susceptible to drift and should not be used near sensitive non-target vegetation. Microbial breakdown of 2,4-D occurs within several weeks; therefore, annual application may be required.

- ◆ Clopyralid is sold under the trade names of Stinger and Curtail. Curtail is a mixture of 2,4-D and clopyralid, whereas Stinger is composed of the active ingredient clopyralid alone. The chemical is absorbed by both foliage and roots and translocates upward and downward in plants, accumulating in the active growing points (Colby *et al.* 1989). The persistence of clopyralid is similar to that of dicamba. Clopyralid is more selective than picloram, dicamba, 2,4-D, or glyphosate, and, at recommended application rates, will not harm many broadleaf forbs and trees. It is highly effective on plants in the composite family, including knapweed and thistle. The addition of 2,4-D to clopyralid will increase the spectrum of plants that are controlled. Clopyralid is not strongly adsorbed, and can leach in coarse-textured soils. Applications of this herbicide are restricted on soils with rapid to very rapid permeability and a shallow water table.
- ◆ Glyphosate is a non-selective herbicide marketed as Roundup, Rodeo, and Accord. Depending on the formulation, it can be used for crop, noncrop, forestry, and aquatic weed

control. Glyphosate is absorbed by the leaves and transported throughout the plant where it disrupts photosynthesis. It is a nonselective herbicide that will kill both grass and broadleaf plants. Glyphosate adsorbs tightly to soil and its ability to leach in soils is low. Microbial breakdown is relatively slow; however, the herbicide binds so tightly to soil that it is not absorbed by plant roots. Revegetation is usually necessary following applications of glyphosate. Rodeo and Accord are labeled for use in or near water.

Application rates, measured in pounds of active ingredient (AI) per acre, vary for each herbicide or combination of herbicides depending on the target species, control objective, and environmental conditions. To assure proper application, it is essential that all guidelines and label restrictions are carefully followed. Use of many herbicides is restricted near surface water and areas with high water tables; under certain wind, temperature, and soil moisture conditions; and during some stages of plant growth. Recommended application rates for noxious weeds in Montana are shown in Table 2-2.

Various herbicide application methods can be used, depending on objectives, manpower, topographic limitations, economics, equipment availability, and potential impacts. Methods include aerial application by helicopters or airplanes; vehicle-mounted spray equipment with a boom, single broadjet, or hand-held pressure nozzles; control droplet applicators (CDAs) on singular- or multiple-head booms for vehicles or handheld units; and backpack sprayers, hand-held pressure nozzles, or hand-held CDAs which allow individual plant treatment.

TABLE 2-2

**HERBICIDES COMMONLY RECOMMENDED
FOR CONTROL OF CATEGORY 1 AND 2
NOXIOUS WEEDS ON RANGE AND PASTURE**

CATEGORY 1 WEEDS	HERBICIDE	APPLICATION RATE PRODUCT PER ACRE	APPLICATION TIMING
Leafy spurge	Tordon 22K Banvel 2,4-D Roundup	1-3 quarts 2-4 quarts 1-2 quarts 1-2 quarts*	Full flower; fall *Fall
Canada thistle	Tordon 22K + 2,4-D Stinger Curtail Banvel 2,4-D	1 + 1 quart 2/3-1 pint 2-4 quarts 1-2 quarts 1-2 quarts	After emergence to bud; fall
Whitetop	Banvel 2,4-D	2 quarts 2-3 quarts	Early bud; fall rosettes
Field bindweed	Tordon 22K Tordon + 2,4-D Banvel 2,4-D	1 quart 5 + 1 quart 1-2 quarts 1-2 quarts	Full bloom; fall; plants actively growing
Russian knapweed	Tordon 22K Stinger Curtail Banvel 2,4-D	1-2 quarts 1-1.3 pints 3-4 quarts 2-4 quarts 2-4 quarts	Bud stage; fall
Spotted & diffuse knapweed	Tordon 22K Stinger Curtail Banvel + 2,4-D 2,4-D	1 pint 2.3 pints 2 quarts .5 + 1 quart 1-2 quarts	Bolt, fall
Dalmatian toadflax	Tordon 22K Banvel Roundup 2,4-D	2-3 quarts 4 quarts 3-4 quarts 2-4 quarts	Bud to mid-flower
St. Johnswort	Tordon 22 K 2,4-D	1 quart 1-2 quarts	Early bud
CATEGORY 2 WEEDS	HERBICIDE	APPLICATION RATE PRODUCT PER ACRE	APPLICATION TIMING
Dyers woad	Ally + 2,4-D	.5 oz + 1 quart + surfactant	Rosette stage
Purple loosestrife	2,4-D Rodeo	.5-1% solution 1-2 quarts	Before seed shatter when actively growing Late flower
Sulfur cinquefoil	Tordon 22K Tordon + 2,4-D Banvel + 2,4-D Ally	1 pint 1 pint + 1 quart .5 + 1 quart .5 oz + surfactant	Bolt to early bud

Sources:

Lacey *et al.* 1985Lacey, C.A. *et al.* 1986

Lacey and Lacey 1986

McKone, M. 1991

Montana State University Agricultural Experiment Station, Weed Control Research 1985 to 1990

BIOLOGICAL WEED MANAGEMENT

Biological weed management involves the use of living organisms, such as grazing animals, insects, and pathogens, to control weeds. The objective of biological weed control is not the eradication of weeds, but the reduction and long-term stabilization of weed density at a sub-economic level.



Aphthona sp on Leafy spurge

Biological weed control often attempts to recreate a natural balance of plant species and predators. Because many plants identified as "noxious weeds" are not native to North America, they have few established natural predators in Montana. Therefore, insects and diseases must be imported from regions where the weeds occur naturally. Insects have dominated biocontrol programs, but other agents, such as fungi and nematodes, are receiving increased consideration.

Biocontrol programs with insects or pathogens may be a relatively slow process, often taking 10 to 15 years before reductions in weed density are

evident (Story 1984). Harris (1979) reported that the cost of controlling a weed biologically in Canada ranged from \$1.2 to \$1.5 million. However, successful biocontrol programs with insects have the potential to be cost-effective, since they are pest-specific, permanent, and applicable over large areas with little or no additional expense (Hansen 1991). The first large-scale biological weed control program was tested in Hawaii in 1902, where a series of insects was released to control the exotic shrub *Lantana camara*. By the 1980's, biological control programs utilizing introduced plant-eating insects or pathogenic fungi had been used on more than 80 weed species throughout the world. About 35% of these projects have been at least partially successful in reducing weed-infested acreage (Hansen 1991).

In Montana, attempts to biologically control weeds began in 1948 with the introduction of two defoliating beetles to attack St. Johnswort (goat-weed). To date, over two dozen insects have been established to combat at least seven noxious weed species in Montana. Table 2-3 presents the status of biocontrol agents utilized to control noxious weeds in Montana.



Urophora sp for Spotted knapweed

TABLE 2-3
BIOCONTROL AGENTS IN MONTANA

HOST PLANT SPECIES	INSECTS AND PATHOGENS					
	Scientific Name	Type	Part Attacked	Status	Date Released	Where 1st Released
Canada thistle	Ceutorhynchus litore	Weevil	Stems/roots	Established	1972	MT
	Urophora cardui	Tephritid Fly	Stems	Established	1985	OR
Diffuse knapweed	Aceria centaureae	Mite	Leaves	Quarantine	N/R	N/R
	Bangasternus fausti	Weevil	Seed head	Established	1990	OR
	Metzneria paucipunctella	Moth	Seed head	Established	1975	MT
	Pelochrista medullana	Moth	Root	N/R	1980	N/R
	Pterolonche inspersa	Moth	Root	N/R	1988	N/R
	Puccinia jaceae	Fungus	Leaves	Native	N/R	N/R
	Sclerotinia sclerotiorum	Fungus	Crown	Native	N/R	N/R
	Sphenoptera jugoslavica	Beetle	Roots	Established	1981	OR
	Urophora affinis	Tephritid Fly	Seed head	Established	1973	MT
	Urophora quadrifasciata	Tephritid Fly	Seed head	Established	1988	MT
Field bindweed	Aceria malherbe	Mite	Leaves	Established	1990?	TX, NJ
Leafy spurge	Aphthona abdominalis	Flea Beetle	Roots/leaves	HST/Quarantine	1991?	(Rome)
	Aphthona cyparissiae	Flea Beetle	Roots/leaves	Established	1987	MT, ND
	Aphthona czwalinae	Flea Beetle	Roots/leaves	Established	1987	ND
	Aphthona flava	Flea Beetle	Roots/leaves	Established	1985	MT, ND
	Aphthona nigricutis	Flea Beetle	Roots/leaves	Established	1989	MT, ND, ID
	Chamaesphesia crassicornis	Clear Winged Moth	Roots	HST/Quarantine	1992?	MT
	Chamaesphesia empiformis	Clear Winged Moth	Roots	Not Established	N/R	CA
	Hyles euphorbiae	Moth	Leaves/flowers	Established	1966	MT
	Oberea erythrocephala	Beetle	Stems/roots	Established	1982	MT
	Oxicepta geographica	Moth	Leaves/flowers	HST/Quarantine	N/R	MT
	Simyra dentinosa	Moth	Leaves/flowers	HST/Quarantine	N/R	MT
	Spurgia esulae	Fly	Growing tips	Established	1985	MT, ND
Purple loosestrife	Galerucella californiensis	Weevil	N/R	HST/Quarantine	N/R	N/R
	Galerucella pusilla	Weevil	N/R	HST/Quarantine	N/R	N/R
	Hylobius transversovittatus	Beetle	N/R	HST/Quarantine	N/R	N/R
Spotted knapweed	Agapeta zoegana	Moth	Roots	Established	N/R	MT
	Bangasternus fausti	Weevil	Seed head	Established	N/R	MT
	Cyphocleonus achates	Weevil	Roots	Established	1988	MT
	Metzneria paucipunctella	Moth	Seed head	Established	1975	MT
	Sclerotinia sclerotiorum	Fungus	Crown	Native	N/R	MT
	Urophora affinis	Tephritid Fly	Seed head	Established	1973	MT
	Urophora quadrifasciata	Tephritid Fly	Seed head	Established	1988	MT
St. Johnswort	Agrilus hyperici	Beetle	Roots	Established	1940s	CA
	Aplocera plagiata	Moth	Leaves/flowers	Established	1985	MT
	Chrysolina hyperici	Beetle	Leaves/flowers	Established	1940s	CA
	Chrysolina quadrigemini	Beetle	Leaves/flowers	Established	1940s	CA
	Zeuxidiplosis giardi	Fly	Leaves	Established	N/R	CA, HI

HST = Host Specificity Testing
N/R = Non Reported

Revised March 21, 1991

Source: USDA/ARS
Rangeland Weed Laboratory
Biological Control of Weeds Research Unit
Montana State University, Bozeman, MT 59717

Several insects are well established and are expanding their populations in Montana. The seed head flies (*Urophora affinis* and *U. quad-rifasciata*) are established on spotted knapweed throughout much of western Montana (Story and Nowerliski 1984). Although the flies alone are not expected to reduce spotted knapweed populations, they have been reported to decrease seed production up to 95% (Story 1984). The hawkmoth (*Hyles euphorbiae*) on leafy spurge, *Chrysolina* beetle on St. Johnswort, and *Rhinocyllus conicus* on musk thistle are other insects that are well established and expanding their populations. The spurge hawkmoth and *Chrysolina* beetle have had limited impact on host plants in Montana. Other insects are currently established in extremely low numbers or in experimental stages in the state (Nowerliski 1991; Story 1991).

Managing livestock to utilize a target weed has proven successful in several areas in Montana. Grazing animals will not eradicate a weed, but with proper timing they can decrease weed density and limit spread by reducing seed production. A good example is the use of sheep for controlling leafy spurge (Landgraf *et al.* 1984; Lacey *et al.* 1984; Aderhold 1984). Sheep and cattle have also been managed under intensive grazing systems to utilize spotted knapweed (Cox 1983; Robbins 1989). In Stillwater County, goats have been used at fishing access sites to stop seed production of leafy spurge. The economic feasibility of grazing certain kinds of animals may be limited by predator management restrictions.

MECHANICAL AND CULTURAL WEED MANAGEMENT

Historically, manual and mechanical methods were the most common weed control techniques used. These methods involve physically destroying the weed or interfering with reproduction by pulling, digging, or cutting. Although these methods are effective on annuals or tap-rooted species, such as spotted knapweed, they are not effective on deep rooted perennials, such as leafy spurge and Canada thistle. Generally, hand removal is effective in areas of initial colonization when native species are present to fill the niches. It is not recommended on high-density infestations.

Cultivation by mechanical methods is effective on most tap-rooted and annual weed species, generally in a cropland situation. Cultivation stimulates germination of weed seeds by bringing them to the soil surface, where resultant weed seedlings can be easily controlled with a second tilling. Although cultivation is most effective on annual weeds, some perennials can be effectively controlled by repeated tilling throughout the growing season for several years.

Mowing can reduce seed production of some weed species. The timing and frequency of mowing necessary to reduce seed production will vary with each species. For example, Popova (1960) reported an increase in density of diffuse knapweed when mowed. However, Davis (1991) noted a decrease in seed production of spotted knapweed when mowed at the late bud to early bloom growth stage. Response of a plant to mowing may vary with environmental conditions, especially moisture that follows the mowing event. Mowing may weaken some non-target species in treated areas, while rhizomatous grasses may be benefited.

Prescribed burning has been used for control of several shrub and tree species. However, burning has little effect on most annual and herbaceous species (including noxious weeds) and has actually been reported to cause an increase in diffuse knapweed (Popova 1960). Moderate and low intensity fire has not been observed to kill noxious weed seeds.

Cultural methods of weed control that enhance the growth of desired vegetation may help slow invasion onto a site. Since noxious weeds are typically opportunistic pioneers of open sites, any practice that favors the retention or introduction of desirable plants that can dominate or outcompete weeds can serve as a control. Examples include seeding competitive grasses and legumes, crop rotation, fertilization, use of mulches, irrigation, and implementation of grazing systems to increase the competitive ability of native species. On forested sites, improving brush and tree canopy cover along roadsides can reduce weed density and slow invasion (Losensky 1987). Disturbed areas, such as roadsides, construction sites, and areas denuded by wildfire, can be

seeded immediately with fast-growing grasses and legumes to reduce the potential for noxious weed invasion.

PREVENTIVE WEED MANAGEMENT

The objective of preventive weed management is to stop the introduction of weed seed and plant parts into non-infested sites. Since established weeds are often persistent and costly to manage, prevention is the most practical and cost-effective method of control. Preventive measures include: the use of weed seed-free hay; eradication of newly established infestations; the use of clean seed; cleaning tillage and harvest equipment before moving it to a non-infested area; keeping irrigation ditches, fence rows, roadsides, and other non-crop areas free from weeds; keeping weed-infested soil, straw, or manure out of non-infested areas; reseeding after a disturbance; and not allowing newly established weeds to set seed.

Noxious weed prevention and control has been addressed in range allotment management plans and special use permits issued by land management agencies. Some guidelines for preventing the movement of weeds on rangeland include monitoring livestock grazing and range condition to avoid over-utilization of native species. Livestock that are moved from a weed-infested pasture should be confined to a small area for several days to allow weed seed to pass through the animal and prevent the introduction of seed into a pasture free of noxious weeds. Herding and placement of salt can be used to a limited extent to keep livestock out of weed infestations.

Motor vehicles have been identified as a major distributor of noxious weed seeds, especially spotted knapweed (Trunkle and Fay 1991). Restriction of off-road travel and road closures will prevent movement of weeds into non-infested areas. Tires and undercarriages of vehicles and field equipment should be cleaned regularly and kept free of weed debris to avoid transportation of seeds. Weeds should be controlled in parking areas, equipment yards, stock yards, road turnouts, and other areas frequented by vehicles to prevent movement of seed to new sites. Gravel pits and other sources of construction materials should be free of noxious weeds or quarantined to avoid seed transport.

EDUCATION

The key to controlling noxious weeds in Montana is early detection and treatment. Public awareness programs on weeds improve detection of invading weed species and increase public support for county, state, and federal weed management programs. Tours, meetings, printed bulletins, radio and television announcements, youth "weed bounty" programs, and other media techniques have been used for increasing awareness about noxious weeds.

Many groups, including Montana State University Cooperative Extension Service (CES), MDA, and the Montana Weed Control Association (MWCA), have been actively involved in educating the public about noxious weeds. Informational goals include: increasing the general public's awareness of noxious weeds; communicating weed research results; and providing training on weed biology, ecology, and weed management techniques. County weed boards and extension service personnel have been instrumental in organizing and promoting public education programs at the local level. Cooperative weed management projects that receive funding from the NWTF must include educational programs as part of their integrated weed management approach.

The Montana Weed Control Association was formed in 1958 to promote weed research, education, and legislation concerning noxious weeds. The organization has a wide variety of membership and has been actively involved in establishing a statewide training program for weed supervisors, developing and disseminating weed science knowledge, coordinating cooperative weed control programs at all levels, and informing the general public about the magnitude and impact of weed problems in the state. The association also publishes a newsletter that reports on NWTF projects.

INTEGRATED WEED MANAGEMENT

Integrated weed management (IWM) is a comprehensive approach to achieving economical weed control in an environmentally acceptable manner. Components include: education, prevention, and early detection; cultural, manual, and mechanical control; biological control; and chemical control. Each of the components may be used separately

or enhanced by combining with other methods to produce a more effective strategy. An example of integrated weed management is the use of sheep and herbicides to manage large infestations of leafy spurge. Sheep are used within the leafy spurge infestation to stop seed production and herbicides are used on the perimeter to contain the lateral spread of the plant. Other examples include the use of crop rotations and herbicides to control Canada thistle and annual weeds within cultivated areas; and integrating insects, grazing animals, herbicide treatment and reseeding competitive species, to manage large-scale spotted knapweed infestations.

Follow-up management is an important component of any integrated weed management program, especially on range and pasture sites. The degree of follow-up management will determine the longevity of control obtained with chemical, biological, or cultural weed control methods. Because most noxious weeds have persistent and tenacious growth characteristics and seeds that remain viable for years, long-term control programs must be implemented. These include re-treatment with herbicides or continued cultural, mechanical, or biological management practices to maintain low weed populations. Range improvements, such as grazing systems, cross fencing, and water developments to facilitate a more competitive plant community, will retard the reinvasion of many weed species. Sites that are devoid of desirable species should be reseeded to competitive plant species as a part of the total management program.

MONTANA WEED MANAGEMENT PROGRAMS

Thousands of acres of noxious weeds infesting Montana range and timber land are managed annually with herbicides, biocontrol agents, and cultural and mechanical methods. Weed management plans by local, state, and federal agencies often employ an integrated approach that includes education and prevention programs in addition to various control methods.

Cooperative projects supported by the NWTF identify the importance of federal, state, and local entities working together to manage noxious weeds within contiguous lands. County weed district personnel and private landowners within these groups are instrumental in working with

many state and federal agencies to initiate or improve weed management programs. Weed management programs for county, state, and federal entities and private corporations are described below.

COUNTY WEED DISTRICTS

Each county in Montana has a weed control district comprised of a weed board appointed by the county commissioners. A county weed supervisor may be hired by the Board to act as an advisor and manager for weed control projects in the district and to implement the county weed management plan. Responsibilities include: identifying, mapping, and evaluating specific weed infestations in the county; managing biological, cultural, and chemical control programs; and coordinating control efforts between private, county, state, and federal land managers. In addition, weed control districts help initiate and coordinate NWTF grant projects, and conduct training and educational programs.



Most county weed districts are funded through a county mill levy. Table 2-4 contains the county weed budgets for FY 1991. Counties with larger populations generally have the greatest funding available to conduct weed management programs. These counties can support a full-time weed supervisor and additional summer staff, whereas smaller counties with less funding may depend on part-time supervisors and limited staff. Figure 2-2 shows the employment status of weed supervisors in each county. Passage of Initiative 105, which froze mill levies at 1986 levels, has forced weed supervisors to balance escalating costs with fixed budgets. The total budget for

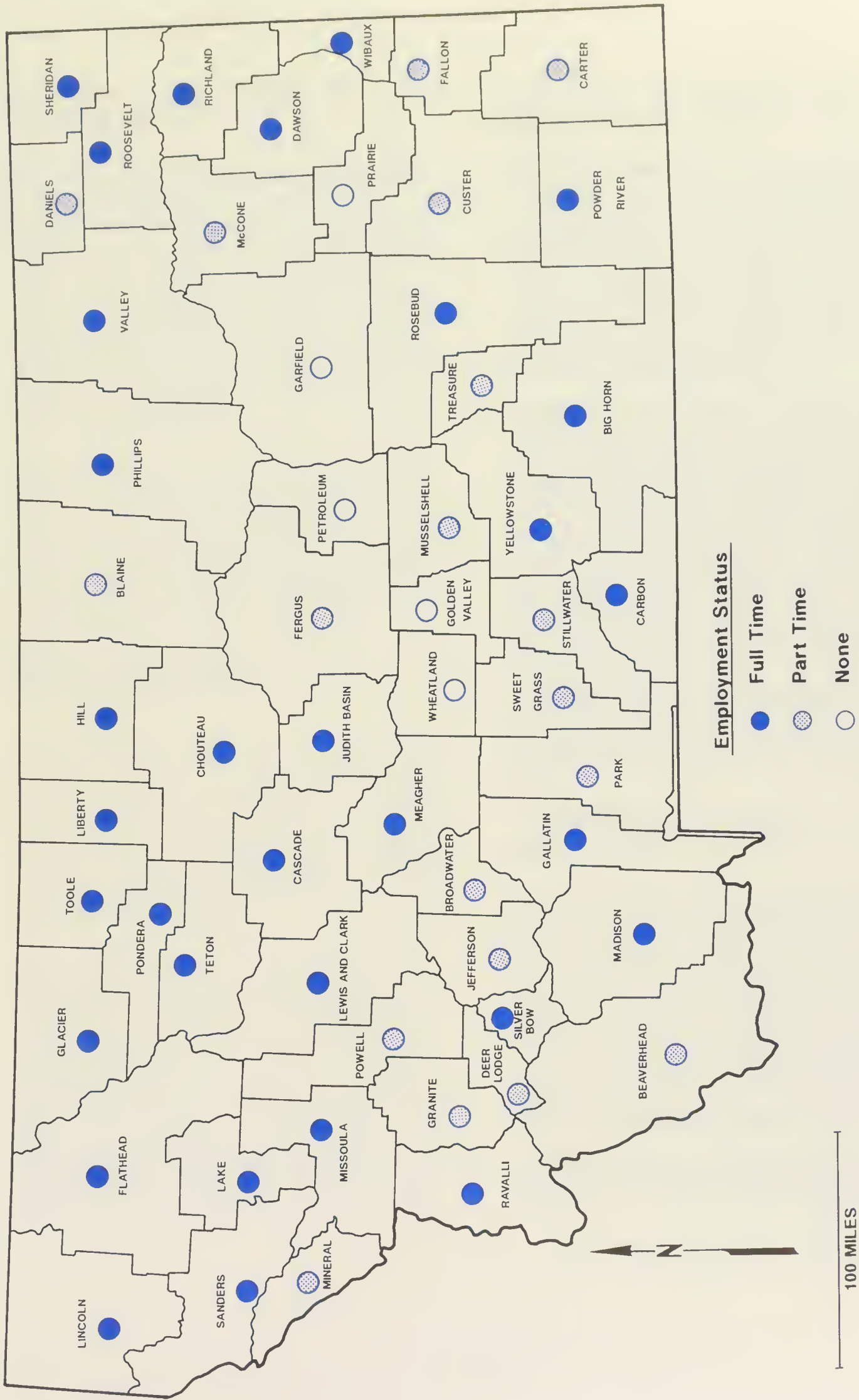
county weed control programs in Montana is \$4.3 million.

Noxious weed control programs vary considerably among counties because of differences in funding. Some counties with limited funds are restricted to a roadside weed control program on county and state rights-of-way. Larger counties, such as Cascade, Gallatin, and Flathead, have comprehensive programs that include education, weed mapping, collection and redistribution of biological control agents, and coordination of weed control programs among private, state, and federal land managers.

TABLE 2-4
FY 1991 COUNTY WEED FUND BUDGETS

COUNTY	WEED BUDGET	COUNTY	WEED BUDGET	COUNTY	WEED BUDGET
Beaverhead	\$114,738	Granite	\$ 31,124	Powell	\$ 52,875
Big Horn	\$522,453	Hill	\$ 72,333	Prairie	\$ 36,399
Blaine	\$ 66,750	Jefferson	\$105,301	Ravalli	\$ 65,090
Broadwater	\$	Judith Basin	\$ 30,330	Richland	\$ 65,663
Carbon	\$128,150	Lake	\$135,500	Roosevelt	\$111,100
Carter	\$ 83,000	Lewis & Clark	\$228,326	Rosebud	\$ 128,008
Cascade	\$319,812	Liberty	\$ 35,025	Sanders	\$164,800
Chouteau	\$ 69,700	Lincoln	\$ 68,274	Sheridan	\$ 77,870
Custer	\$ 28,956	Madison	\$100,473	Silver Bow	\$ 82,372
Daniels	\$ 13,578	McCone	\$ 32,805	Stillwater	\$109,491
Dawson	\$ 32,200	Meagher	\$ 52,974	Sweet Grass	\$ 41,000
Deer Lodge	\$ 40,650	Mineral	\$ 29,948	Teton	\$114,433
Fallon	\$117,232	Missoula	\$233,405	Toole	\$ 90,112
Fergus	\$ 82,750	Musselshell	\$ 23,260	Treasure	\$ 22,682
Flathead	\$ 247,838	Park	\$ 81,760	Valley	\$ 64,800
Gallatin	\$141,696	Petroleum	\$ 18,000	Wheatland	\$ 33,000
Garfield	\$ 11,700	Phillips	\$ 59,095	Wibaux	\$ 31,979
Glacier	\$130,900	Pondera	\$ 85,636	Yellowstone	\$200,509
Golden Valley	\$ 36,260	Powder River	\$ 57,612		

Source: Montana Association of Counties



Montana County Weed Supervisor
Employment Status
NWTF-Programmatic EIS
FIGURE 2-2

MONTANA DEPARTMENT OF STATE LANDS

The Department of State Lands (DSL) is responsible for management of 5.2 million acres of school trust lands. The control of noxious weeds on school trust lands is the responsibility of the surface lessee. Weed control is a condition of the lease and the lease can be canceled if the lessee does not adequately meet this requirement. Leases are generally issued and/or reviewed at 10-year intervals and lessees are encouraged to cooperate with local weed control supervisors during the lease period.

The DSL has a budget of \$20,000 for the control of noxious weeds on vacant or non-leased land. These funds are channeled into local weed control districts for weed management on vacant parcels. The department has begun a program of biological control on selected tracts using sheep to control leafy spurge (Hagener 1991).

MONTANA DEPARTMENT OF TRANSPORTATION

Montana's 1,250 miles of interstate highways, 5,455 miles of primary roads, 4,641 miles of secondary roads, and 66,259 miles of local and off-system roads provide a web of corridors for the spread of noxious weeds. State and county road rights-of-way and median areas have a high potential for initial weed infestations, as do all new road construction projects.

The Montana Department of Transportation (MDOT) has a noxious weed control policy, but generally contracts with local applicators or county weed control districts for management and control of weeds along rights-of-way. The MDOT compensates county weed control boards for labor, materials, and equipment rental. Herbicide application is the primary method of weed control, with some mechanical means employed in sensitive areas. The 1991 budget for weed control by the MDOT is \$1.4 million (Wiley 1991).

MONTANA DEPARTMENT OF FISH, WILDLIFE, AND PARKS

The Montana Department of Fish, Wildlife, and Parks (MDFWP) maintains a multi-faceted approach in addressing noxious weed management, both on properties it manages for public benefit and as an advisor to others in noxious weed issues. The MDFWP manages 534 sites totaling 431,873 acres; these areas include fishing access sites, state parks, monuments, recreation areas, and wildlife management areas.

The MDFWP has practiced some form of noxious weed management since it purchased the Red Rock Wildlife Management Area in 1916. A formal noxious weed policy was adopted in 1983 with the primary objective of improving cover of native species on MDFWP lands and preserving the soil and its water-holding capacity. Other components of the weed management plan include coordinating control efforts with local weed boards and adjacent landowners, identifying and preventing the spread of noxious weeds through a public education program, and documenting and evaluating the effectiveness of control measures. The MDFWP spends approximately \$71,000 annually on weed control efforts (Knapp 1991).

U.S. BUREAU OF LAND MANAGEMENT

The U.S. Department of the Interior, Bureau of Land Management (BLM), is responsible for the administration of 8.1 million acres in Montana, of which approximately 100,000 acres are infested with noxious weeds (Penfold 1991). The BLM has adopted an integrated approach utilizing chemical, mechanical, manual, and biological methods to annually treat about 15,000 acres of weed infestations in Montana. The 1991 weed control budget is \$329,000 (Morehouse 1991).

Educational efforts are coordinated with those of county, state, and other federal agencies to assist

the public in noxious weed identification, prevention, early detection, and proper management techniques. The BLM has cooperated with the Montana State University Extension Service and the USDA, Agricultural Research Service in developing weed control recommendations and in selecting sites for testing biological agents on public land.

U.S. BUREAU OF INDIAN AFFAIRS

The U.S. Department of the Interior, Bureau of Indian Affairs (BIA), as trustee, is responsible for administration of 5.7 million acres of tribal lands in Montana, of which approximately 180,000 acres are infested with noxious weeds. Prior to 1988, weed control efforts were sporadic and ineffective due to inconsistent funding. Since then, additional funding has provided the ability to develop and expand baseline data inventories, map weed infestations, and document, evaluate, and monitor weed control projects. This information is currently being converted to a computerized Geographic Information System base.

The BIA employs an integrated weed management approach in treating weed infestations on tribal lands. In 1991, the agency will spend \$612,000 to treat approximately 15,000 acres.

NATIONAL PARK SERVICE GLACIER NATIONAL PARK

The U.S. Department of the Interior, National Park Service has proposed a 5-year plan for managing exotic plant species within Glacier National Park (GNP). The goal is to preserve biological diversity of native flora by containing and/or controlling undesirable exotic plant species. The plan proposes an integrated approach that will include inventorying and mapping selected exotic plant species, determining the effects of exotic plants on the biological community, educating the public to prevent introduction and spread of exotic species, and reducing the number, density, and area of aggressive exotics (Lange 1991).

The Federal Noxious Weed Act (P.L. 93-629, Sec. 15) as amended by the 1990 Farm Bill allows

GNP to enter into cooperative agreements with surrounding counties for the control of noxious weeds. As a result, GNP has signed an agreement with Glacier County for the control of noxious weeds in the lower St. Mary Valley on the east side of the park. GNP's 1991 budget for weed control is approximately \$25,000 (Lange 1991).

NATIONAL PARK SERVICE YELLOWSTONE NATIONAL PARK

The goal for managing noxious weeds within Yellowstone National Park (YNP) is similar to that for Glacier Park. An integrated approach is currently being used to control and eliminate spotted knapweed and leafy spurge infestations within YNP and prevent their movement into back-country sites. Although the Resource Management Division has requested significant funding for a weed management program, there has been no revenue directed specifically for weed management within YNP. Limited funds available through other resource programs are not adequate to address the current weed problem within the park (Sweaney 1991).

U.S. FISH AND WILDLIFE SERVICE

The U.S. Department of the Interior, Fish and Wildlife Service (USFWS) manages 1.12 million acres of national wildlife refuges, 34,000 acres of waterfowl production areas, and 23,000 acres of wetlands under protective easements in Montana. USFWS policy requires each station to control state-listed noxious weeds. The manager of each station is responsible for determining the level of control based on the density of infestation, impact to the habitat, and other local conditions.

The use of herbicides to control weeds is discouraged, and chemicals proven harmful to wildlife, wetlands, and ground water are normally prohibited. In 1986, the USFWS applied 1,888 pounds of active herbicide ingredients (AI) to its lands in Montana at a cost of \$13,800. In 1989, 1,107 pounds AI of herbicides were used at a cost of \$8,100 (Hultman 1991).

U.S. FOREST SERVICE

Ten national forests in Montana encompass approximately 17 million acres with 350,000 infested with noxious weeds. Forest supervisors are responsible for planning, coordinating, and implementing noxious weed programs in areas where cooperative efforts with local weed districts are underway. These programs include: inventorying and mapping to determine the type, density, and extent of weed infestations; determining weed control methods; coordinating program implementation with the local weed district; and monitoring projects to assess response.

The U.S. Department of Agriculture, Forest Service (USFS), requires the use of certified seed and mulch for revegetation of disturbed areas, such as logging roads, drill pads, and rights-of-way, and allows only weed-free hay, mulch, or other farm products to be fed, used, or transported onto some forest lands. The USFS 1991 budget for weed control in Montana forests is approximately \$658,000 (Hall, G. 1991).

PRIVATE ORGANIZATIONS

It is difficult to estimate the total revenue expended by private individuals, corporations, and organizations for noxious weed control in Montana. There is no reference available regarding funds allocated by this sector to biological, cultural, or mechanical weed control methods. Based on 1990 estimated herbicide sales for rangeland and non-crop weed control (\$8.5 million), and an average application cost of 2.35 times the cost of herbicide, it is estimated that the private sector contributes over \$20 million annually to the chemical control of noxious weeds in Montana.

Private timber and grazing lands are often interspersed among other state and/or federal lands, making cost-effective weed management difficult. In some cases the wood products industry has a cost-share program or provides in-kind services with adjoining landowners for weed control. Utilities generally employ the same control methods as adjoining landowners for control of noxious weeds on transmission and natural gas line rights-of-way. This may entail cost-share, in-kind services, or contracts with local weed control districts. Although herbicide use is predominant, some organizations are also encouraging increased use of cultural or biocontrol methods.

DESCRIPTION OF THE NOXIOUS WEED TRUST FUND GRANTS PROGRAM



Chapter 3

Noxious Weed Trust Fund

Programmatic Environmental Impact Statement

CHAPTER 3

DESCRIPTION OF THE NOXIOUS WEED TRUST FUND GRANTS PROGRAM

DESCRIPTION OF THE NWTF GRANTS PROGRAM

Noxious weeds are having a substantial impact on the agriculture, environment, and economy of Montana. Weeds have reduced crop yields, displaced native vegetation on range and woodland sites, decreased livestock carrying capacity, and degraded wildlife habitat. During the early 1980's it was recognized that the rapid spread of noxious weeds, large acreages infested, and movement of weeds between various private, state, and federal land ownerships required a coordinated weed management effort.

In 1985, the Montana legislature created the Noxious Weed Trust Fund (NWTF) grants program to assist counties, cooperative weed management groups, researchers, and educators in solving the weed problem in Montana. The program was developed to help coordinate and promote the management of large infestations of noxious weeds and prevent their establishment in new areas. Funds are allocated on a cost-share basis to various types of projects including: on-the-ground cooperative weed management projects; screening, collection, and redistribution of biological control agents; noxious weed research (chemical, mechanical, cultural, and biological); and educational programs.

Initial funding for the NWTF grants program came from a one-time grant of \$1 million from the Resource Indemnity Trust (RIT). In addition, a 1% surcharge was levied on the retail sale of herbicides, to be paid by companies registering and selling herbicides in Montana. In 1987, the legislature approved a \$0.50 weed fee on motor vehicles registered in Montana to be deposited in the NWTF. The amount was increased to \$1.50 per vehicle by the 1989 legislature. Proceeds from the vehicle fee were used for noxious weed

grants, with 25% of the revenue mandated for research and development of non-chemical noxious weed control methods. Table 3-1 presents the 1990 vehicle license fee contributions to the NWTF from each Montana county. The 1987, 1989, and 1991 legislative sessions also provided additional funds totaling \$450,000 for biological control efforts from special oil overcharge monies ("stripper-well funds") paid to the state by U.S. oil companies. In 1991, the NWTF Act was amended to include research and educational programs involving cropland weed problems.

A permanent trust fund was established utilizing half of the original RIT grant monies and annual contributions comprised of half the herbicide surcharge and interest from all revenue sources. The money in trust may not be expended until the principal reaches \$2.5 million, except in the case of a noxious weed emergency. The 1991 legislature placed a "sunset" on the 1% surcharge on herbicides when the trust fund reaches \$2.5 million. On June 30, 1990, the permanent trust fund contained \$1.6 million. Based on projected revenues and interest, the surcharge will be collected through December 31, 1992 (MDA 1990a), after which all interest generated by the permanent trust will be used for the grants program. The trust interest, combined with vehicle weed fees, will generate approximately \$1.5 million annually for NWTF grants and program administration after 1992.

The MDA has prepared project guidelines to assist applicants in writing grant proposals (Appendix C). A standard format for grant applications is also outlined and requires the completion of three forms: Grant Program Application (NW1001); Budget Detail (NW1002); and Environmental Action Checklist (NW1003), where appropriate. Project expenditures are typically on a cost-share basis with local or state

TABLE 3-1

VEHICLE LICENSE FEES CONTRIBUTED TO NWTF JULY 1989 THROUGH JUNE 1990

COUNTY	VEHICLE FEE	COUNTY	VEHICLE FEE	COUNTY	VEHICLE FEE
Beaverhead	\$ 11,888.77	Granite	\$ 4,195.58	Powell	\$ 8,528.31
Big Horn	\$ 13,513.65	Hill	\$ 24,744.68	Prairie	\$ 2,588.41
Blaine	\$ 9,501.46	Jefferson	\$ 12,121.80	Ravalli	\$ 36,384.36
Broadwater	\$ 5,611.51	Judith Basin	\$ 4,881.99	Richland	\$ 17,200.41
Carbon	\$ 13,770.50	Lake	\$ 29,492.96	Roosevelt	\$ 10,863.48
Carter	\$ 2,485.92	Lewis & Clark	\$ 65,382.97	Rosebud	\$ 13,107.10
Cascade	\$ 93,700.55	Liberty	\$ 4,427.60	Sanders	\$ 13,344.65
Chouteau	\$ 11,783.65	Lincoln	\$ 25,141.19	Sheridan	\$ 8,919.59
Custer	\$ 16,245.53	Madison	\$ 9,969.31	Silver Bow	\$ 44,788.41
Daniels	\$ 4,263.64	McCone	\$ 4,829.56	Stillwater	\$ 10,651.22
Dawson	\$ 14,571.35	Meagher	\$ 3,212.62	Sweet Grass	\$ 5,182.02
Deer Lodge	\$ 12,954.28	Mineral	\$ 4,584.38	Teton	\$ 11,708.72
Fallon	\$ 5,562.63	Missoula	\$101,730.75	Toole	\$ 9,063.77
Fergus	\$ 18,842.68	Musselshell	\$ 6,910.38	Treasure	\$ 1,830.83
Flathead	\$ 84,477.37	Park	\$ 21,299.87	Valley	\$ 13,370.94
Gallatin	\$ 66,086.23	Petroleum	\$ 1,172.11	Wheatland	\$ 3,266.63
Garfield	\$ 2,705.74	Phillips	\$ 7,897.90	Wibaux	\$ 2,128.35
Glacier	\$ 14,083.40	Pondera	\$ 10,726.52	Yellowstone	\$145,199.52
Golden Valley	\$ 1,558.74	Powder River	\$ 4,270.44	Fleet Vehicle	\$ 3,016.50

Source: Montana Department of Agriculture, ABSD

organizations, whether public or private. Grants may be issued without matching funds to weed control districts to eradicate or contain noxious weeds newly introduced to the county. Cooperative group projects that are submitted for funding must be sponsored by a county weed district or other government entity. In most cases, projects are eligible to receive funds only if the sponsoring county has funded its own weed management program with a levy in an amount not less than 1.6 mills (or an equivalent amount from another source), or in an amount not less than \$100,000 for first class counties (counties having a taxable valuation of \$50 million or more).

Cooperative group projects must also meet various criteria prior to being considered for funding, including:

- ◆ One year of planning, organization, and/or implementation prior to application.
- ◆ Documentation of landowner cooperation.
- ◆ Project area mapping, including: target weed infestations, areas previously treated, and areas proposed for treatment.
- ◆ Identification of a project coordinator who will keep accurate accounting of all cost-share monies.
- ◆ Identification of environmental concerns, including: an outline of weed control methods to be used, rates and timing of herbicide application, a description of the proper use of herbicides in environmentally sensitive areas, and completed Form NW1003.

- ◆ A financial narrative providing justification of project costs.
- ◆ An outline of how project evaluation will be documented.

Specific information is required from the applicant to document compliance with these criteria as well as compliance with MEPA and/or other rules governing the NWTF grants program.

Grant funding recommendations are made by a nine-member Noxious Weed Advisory Council appointed by the director of the MDA. The council is comprised of the following members:

- ◆ The director of the MDA, who serves as chairman.
- ◆ One member representing livestock production.
- ◆ One member representing agricultural crop production.
- ◆ One member from a sportsman/wildlife group.
- ◆ One member who is a herbicide dealer or applicator.
- ◆ One member from a consumer group.
- ◆ One member representing biological research and control interests.
- ◆ One member from the Montana Weed Control Association.
- ◆ One at-large member from the agricultural community.

The advisory council meets three times each year at different locations around the state to review grant requests. Applicants present their projects to the council and answer questions at that time.

The advisory council and the MDA utilize a scoring system to rank all projects in regard to how well they meet the criteria for the program

(4.5.108 ARM). This project ranking worksheet is contained in Appendix C. Projects are selected for funding based on their feasibility and concordance with the long-range objectives of the NWTF. Projects typically demonstrate cost-effectiveness, increase weed awareness, and enhance weed management in the state. In addition, cooperative group projects should employ an integrated approach to weed management and demonstrate the effectiveness of various management techniques. Approved projects are required to be monitored and evaluated for overall effectiveness and results are reported by the sponsors and MDA personnel. Progress and fiscal reports are submitted to the department on a quarterly basis.

Administrative costs to operate the NWTF grants program have averaged 4.3% since 1985. These costs include administrative expenses incurred by the Noxious Weed Advisory Council, costs for collection of the herbicide surcharge, legislatively mandated indirect costs, and program operations. Since fiscal year 1990 the salaries of the state weed coordinator/trust fund manager and a two-thirds time program assistant have been funded through the grants program administrative budget. Responsibilities have grown with the program, and include, but are not limited to the following:

- ◆ Managing the program budget to operate within authorized parameters.
- ◆ Administering the trust fund to assure monies are distributed among established accounts.
- ◆ Monitoring county weed district and/or community group grants to evaluate the program.
- ◆ Auditing weed control grants to provide program accountability.
- ◆ Arranging meetings with the council to develop rules and evaluate the trust fund and grants program.
- ◆ Monitoring applications for weed control grants to ensure compliance.

- ◆ Coordinating federal, state, and private resources to implement effective weed management.
- ◆ Contacting local weed districts, communities, and individuals to plan and organize weed management projects.
- ◆ Disseminating information on noxious weed management.
- ◆ Contacting scientists, educators, and interested parties to coordinate weed trust fund activities.
- ◆ Cooperating with other western states to coordinate regional weed management programs.

NOXIOUS WEED TRUST FUND PROJECTS

Since its creation in 1985, the NWTF has granted more than \$4.2 million for 319 projects statewide. Approximately \$2.6 million (62%) has been spent on cooperative weed management projects. The remaining \$1.6 million has supported non-chemical research projects (24%), other research (5%), and educational programs (9%). Appendix D contains a summary report prepared on the NWTF.

In 1990, the NWTF contributed approximately \$665,000 to cooperative project areas, with about \$500,000 used for the purchase of herbicides in Montana. Based on total revenues generated from herbicide sales in the state (\$36.7 million for

1990) and an estimate that 32% of the herbicides were purchased for noxious weed control (Mullin 1991), the NWTF accounts for less than 5% of herbicides purchased for noxious weed control in Montana. Table 3-2 presents supporting calculations on how this figure was derived.

The NWTF granted \$275,200 in 1990 toward biological control research with insects, pathogens, and grazing animals. Since the beginning of the NWTF program, these grants account for over 50% of total state revenue expended on biological control research. Additional grants awarded in 1990 include \$59,000 to other weed research and \$120,950 toward educational programs. (See Appendix D for more specific information.)

Individual projects are approved for funding from one to several years depending on the scope of the project. Approximately 112 grant projects were ongoing throughout the state in 1990. Of these 112 projects, 35 were visited and evaluated by the state weed coordinator (Mullin 1991). County weed budgets and grants received by them are audited by the Montana Department of Commerce at least every 2 years through routine county audits.

In order to describe the overall performance of the NWTF program, projects funded by the NWTF were evaluated to measure the effectiveness of the grant program. Individual projects were divided into four categories, including: cooperative group projects, biological research projects with insects, other research, and educational programs. A review of the four different types of projects follows.

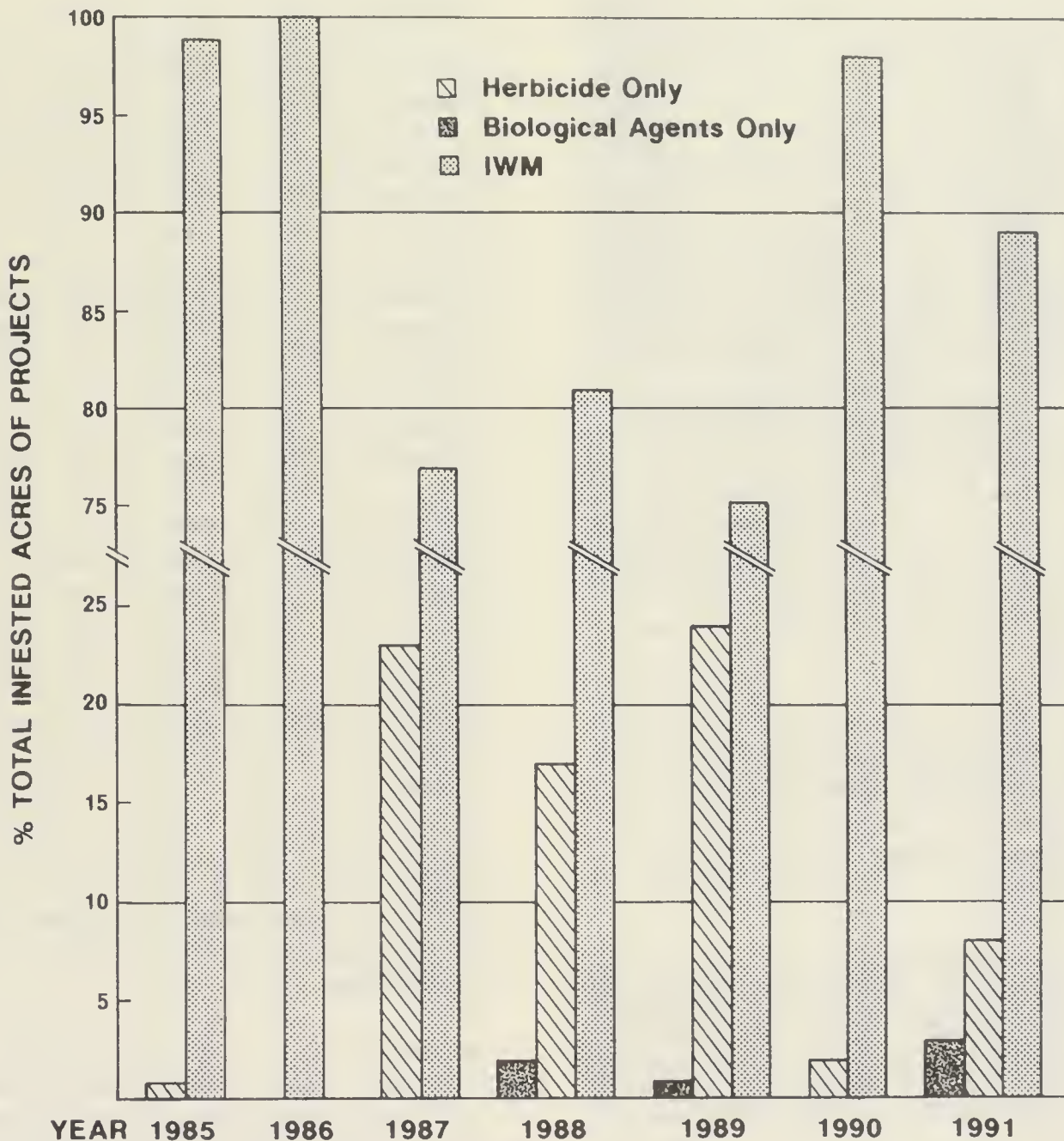
TABLE 3-2
SUPPORTING CALCULATIONS
NWTF CONTRIBUTION TO CHEMICAL WEED CONTROL

No.	Percentage	Description	Cost Figure
1	1%	Herbicide surcharge for 1990	\$ 367,755.00
2	100%	Total herbicide sold in 1990	\$ 36,776,000.00
3	32%	Estimated herbicide sold for noxious weed control (Mullin 1991)	\$ 11,769,000.00
4		NWTF grants for on-ground control - 1990 (portion of cost-share for herbicide purchase)	\$ 500,000.00
5	4.2%	NWTF contribution towards chemical control of noxious weeds in Montana (Costs - #4 divided by #3)	

COOPERATIVE GROUP PROJECTS

A total of 188 on-the-ground cooperative weed management projects were funded from 1985 through fiscal year 1991. The majority of projects involved management programs on spotted knapweed, followed by leafy spurge, Dalmatian toadflax, sulfur cinquefoil, Russian knapweed, whitetop, and purple loosestrife. Management

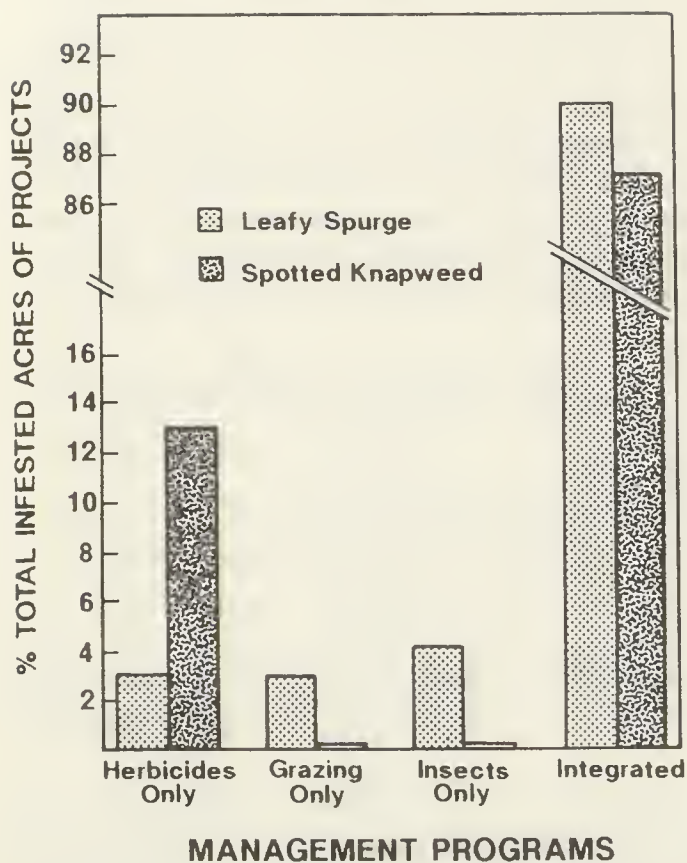
techniques have been applied statewide to approximately 280,000 acres of knapweed (including spotted and diffuse) and 72,166 acres of leafy spurge since 1985. All cooperative group projects included education as part of their programs, and the majority used an integrated weed management approach (Figure 3-1). Herbicide-only programs were utilized to a greater degree for management of spotted knapweed infestations than for leafy spurge (Figure 3-2).



Percent of Leafy Spurge and Spotted Knapweed Infested Acreages Treated Under NWTF On-the-Ground Management Programs; 1985-1991

NWTF-Programmatic EIS
FIGURE 3-1

Source: Unpublished Data, NWTF Grant Files



MANAGEMENT PROGRAMS
 Percent of Leafy Spurge and Spotted Knapweed
 Acres Treated With Various Management Methods,
 NWTF-Programs 1985-1991
 NWTF-Programmatic EIS

Source:
 Unpublished Data, NWTF Grant Files

FIGURE 3-2

A review of selected cooperative group projects funded by the NWTF program follows.

Southwestern Cooperative Weed Control Area

Because of the large number of local cooperative projects, it was not possible to include a detailed review of all areas. The Southwestern Cooperative Weed Control Project (SWCP), initiated in 1985, was selected for review based on the following criteria:

- ◆ It was one of the first cooperative projects implemented.

- ◆ No NWTF revenue is currently being expended in the original project area.
- ◆ It received the largest amount of funding in 1985 (\$231,256).
- ◆ It encompassed a relatively large area involving four counties.
- ◆ Several of the project areas ultimately served as a model for current cooperative projects in the state.

The project area included portions of Silver Bow, Madison, Jefferson, and Granite Counties. Spotted knapweed infested the largest acreage in the project area, with smaller infestations of Dalmatian toadflax, leafy spurge, and dyers woad.

Weed management techniques used within the four-county area included herbicide applications, release of the knapweed gall fly, development of herbicide demonstration plots, hand pulling and cultivation within residential areas and environmentally sensitive sites, and experimental releases of a fungal agent to control spotted knapweed.

Educational programs included an annual tour to show the effectiveness of the program in each county. Special programs for the four-county area included project area tours for legislators, East Pioneer Stewardship participants, and members of the Intermountain Section of the Society for Range Management. Weed awareness days were held involving schools, civic and special interest groups, and local officials. Numerous radio and television programs were aired to increase weed awareness. Over 30,000 spotted knapweed brochures were printed by the counties and distributed by sportsman groups, Montana Department of Fish, Wildlife and Parks, and weed boards.

Although the four counties worked together as a cooperative group, cost-share funds from the NWTF were distributed to individual project areas over a 3- to 5-year period. The amount of funds received in each project, number of acres infested, and an evaluation of individual county projects are described below.

SILVER BOW COUNTY

The Stewardship project area encompassed 85,000 acres of rangeland, of which 3,000 acres were infested with spotted knapweed. Total revenue received from the NWTF was \$66,500 over a 3-year period. NWTF cost-share revenue has not been received in this area since 1988, however, control programs are on-going, using funds from private, state, and federal sources.

Herbicides, experimental releases of *Sclerotinia sclerotiorum*, hand pulling, and release of the knapweed gall fly were used for controlling spotted knapweed. Visual estimates taken in 1991 indicate that less than 10% (approximately 200 acres) of the original spotted knapweed infestation remains. Research has shown that spotted knapweed can spread at a rate varying from 12 to 27 percent. Based on a conservative estimate of 15% annual spread rate for spotted knapweed, a total of 6,938 acres would be infested if control measures had not been initiated.

Because of educational programs on noxious weed identification, a 10-acre infestation of dyers woad was found within the project area south of Butte. In 1985, 4,000 dyers woad plants were pulled from the 10-acre site. By 1991, only 54 plants remained on the site and these were removed by hand pulling. In comparison, a 100-acre dyers woad infestation located south of Dillon that was not part of an active weed management area spread from 100 to 200 acres between 1986 and 1991 (Hahnkamp 1991).

There have been no reports of damage caused to non-target vegetation by any of the control techniques utilized in the project area. The amount of herbicide necessary to manage knapweed within the project area has declined over 85% since the project was initiated.

GRANITE COUNTY

The Philipsburg project area encompassed 37,000 acres, of which 3,230 acres were infested with spotted knapweed. Infestations occurred in the town of Philipsburg, railroad and highway rights-of-way, and surrounding private and federal lands.

Total revenue received from the NWTF was \$53,201 over a 4-year period. NWTF cost-share revenue has not been received since 1989. The weed management program is on-going with funds from private, county, state, and federal land management agencies.

Education of the general public and federal agency personnel was an important part of the Philipsburg project. Public meetings, training sessions, newspaper articles, and tours were used to increase awareness and concern about noxious weeds. Press releases were used to inform residents about the cooperative project and the types of control techniques that were proposed. Residents with concerns about herbicide applications were urged to contact the county extension agent or county nurse. Public announcements, in addition to direct contact with concerned individuals by the sheriff's office or county extension agent, were made several days prior to herbicide applications. Residents could also request that herbicides not be applied on roadsides adjacent to their property. Hand pulling, mowing, or non-persistent herbicides were used in residential areas or on other environmentally sensitive sites.

Visual estimates by the project coordinator in 1991 indicate that only 230 acres of spotted knapweed remained, or 7% of the original infestation. Based on a 15% spread rate, a total of 7,471 acres would be infested with spotted knapweed without an active control program. There were no reports of herbicide injury to non-target plants, or other damage, as a result of weed control methods used in the project area.

MADISON COUNTY

The Virginia Hill project area encompassed 40,000 acres with 10,000 acres infested by spotted knapweed. The NWTF provided \$81,506 in cost-share funds over a 3-year period beginning in 1985. Although NWTF revenue has not been received by this project since 1988, it remains an active management area.

The project area encompassed a subdivision, two incorporated towns, and adjacent state, federal, and private rangeland. Educational programs,

herbicide applications, and release of biological control agents were used in the integrated program. Because of the relatively large acreages infested with spotted knapweed, the goal of the project was to contain the spread of the weed and control infestations in the most critical areas.

Soil properties and depth to ground water were evaluated to determine areas sensitive to herbicide applications. Short-residual herbicides, hand pulling, and releases of the knapweed gall fly were used in residential areas and sites near open water or shallow ground water. There were no complaints received from county residents as a result of the control efforts; however, several calls were received from people who wanted more areas of knapweed treated (Peterson 1991). There was no evidence of damage to non-target vegetation, including sensitive crops, trees, or shrubs. Production of native grass species increased 200% to 800% following herbicide application.

Estimates in 1991 by the project sponsor indicate that complete control of spotted knapweed was achieved on approximately 4,000 acres, and partial control on the remaining 6,000 acres. It is believed that the infestation is contained within the original boundaries. Based on a 15% annual spread rate, about 22,800 acres would now be infested if no program had been initiated.

JEFFERSON COUNTY

The Jefferson County project originally encompassed an area of 70 square miles and was subsequently enlarged to include 311 square miles. Approximately 49,662 acres were infested with noxious weeds. The NWTF provided \$30,059 in cost-share funds from 1985 through 1990 (Kountz 1991).

The project was organized by the weed district in 1985 and presented to landowners when the grant was approved. Initial participation by private landowners was relatively slow, but the project eventually expanded to include 126 interested landowners. Although herbicides and hand pulling

were the primary methods used to manage noxious weeds, releases of the knapweed gall fly were made in 1988.

While private landowners were successful in managing about 5,580 acres of noxious weeds as a result of the cost-share program, several problems emerged. The large number of acres involved made it extremely difficult to develop cooperative control efforts between adjacent landowners and untreated sites continued to serve as a source of spread to treated areas. In addition, the acreage infested with noxious weeds was too extensive to manage in a single program. Since only 11% of the total infested area was treated over the 5-year period, the management program was not successful in containing noxious weeds in the entire project area.

The program was completed in 1990; it is not known whether cooperating landowners are continuing to manage the weed infestations, and no information is available concerning the present acreage infested with weeds.

SUMMARY

This review of cooperative programs funded by NWTF indicates that three of the four projects were successful in managing spotted knapweed (Figure 3-3). The effectiveness of cooperative projects is directly related to the commitment of the project leaders and participants in the project areas. Other observations obtained from the review are:

- ◆ An integrated weed management approach should be utilized on most cooperative projects.
- ◆ Project areas should be relatively small in scale and have well-defined boundaries.
- ◆ Projects must be organized by participants in the project area, with weed boards and weed supervisors providing support for the group.
- ◆ A landowner within the project area should serve as the project leader.

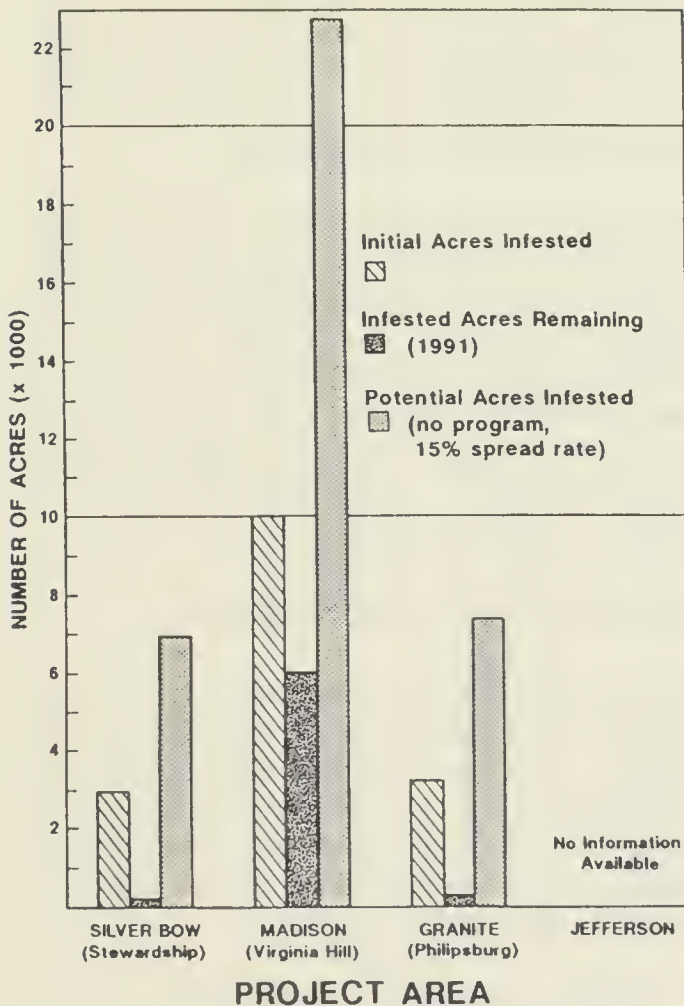
Biological Control of Spotted Knapweed

To date, the NWTF has awarded approximately \$397,900 to the knapweed biological control effort at the Western Agricultural Research Center in Corvallis, Montana. A total of \$272,700 has been used to fund the foreign host specificity-testing of two seed head flies, (*Chaetorellia acrolophi* and *Terellia virens*), and a seed head weevil (*Larinus obtusus*); \$85,400 has been used to fund the foreign collection of three root moths (*Agapeta zoegana*, *Pterolonche inspersa*, and *Pelochrista medullana*), a root weevil (*Cyphocleonus achates*), and a seed head fly (*Chaetorellia acrolophi*). The remaining \$39,800 has been used to fund mass-rearing of the root moth (*A. zoegana*) and the root weevil (*C. achates*). During the last 2 years, more than 19,000 root moth adults have been redistributed as a result of the rearing efforts. Host-specificity tests have been completed on the two seed head flies and testing of the seed head weevil should be completed in 1991 (Story 1991).

The NWTF has been instrumental in helping secure the biological agents necessary for control of spotted knapweed. All overseas testing and collections of the insects and about one fourth of the mass-rearing efforts have been funded by the NWTF. In addition to NWTF grants, research efforts within Montana have been funded by Montana State University, with some assistance from county weed districts (Story 1991).

Biological Control of Musk Thistle

The NWTF awarded \$15,000 to Montana State University to study insects for biological control of musk thistle. To date, four insects have shown promise as control agents. A weevil (*Trichosiocalus horridus*) is currently being redistributed from populations in Wyoming. One population is now established near Corvallis, Montana and establishment of the insect has been confirmed at two sites where releases were made in 1990. A stem-boring fly (*Cheilosia corydon*) has been released at one location in Montana and biological studies are ongoing.



Case Study: Spotted Knapweed Infestation
Southwestern Cooperative Weed Control Project
NWTF-Programmatic EIS

Source:
Unpublished Data, NWTF Grant Files

FIGURE 3-3

BIOLOGICAL RESEARCH WITH INSECTS

The NWTF provides over 50% of the budget for biocontrol research, excluding federal programs, in the state (Mullin 1991). The majority of these funds have been awarded to Montana State University entomologists who receive matching funds from their departments. Funds have been allocated for screening, collection, rearing, and redistribution of insects on spotted knapweed, leafy spurge, musk thistle, and Dalmatian toadflax.

Projects that involve biological control with insects were evaluated based on the number of insects collected, screened, reared, or released as a result of funds received through the NWTF. Following is a review of those projects.

Host-specificity testing is continuing on *Cassida rubiginosa* and a flea beetle (*Psylloides chalcamera*) (Littlefield 1991).

Biological Control of Leafy Spurge and Dalmatian Toadflax

The Entomology Research Lab at Montana State University has received approximately \$250,000 from the NWTF for screening of foreign insects on leafy spurge and Dalmatian toadflax. Approximately 60% of the revenue has gone toward leafy spurge and the remainder to Dalmatian toadflax. Six insects have been screened thus far on leafy spurge, including: three root boring insects, (*Pegomya curticornis*, *Chamaesphecia hungarica*, and *Chamaesphecia crassicornis*); a flea beetle, (*Aphthona lacertosa*); a gall midge, (*Spurgia esulae*); and a web worm, (*Oxicesta geographica*). These insects are scheduled to arrive in Montana in 1992 (Noweriski 1991).

Screening has also been completed on three insects for toadflax: *Eteobalea intermediella* and *Mecinus janthinus* on Dalmatian toadflax, and *Eteobalea serratella* on yellow toadflax. These insects are also scheduled to arrive in Montana in 1992 (Noweriski 1991).

The NWTF has enabled Montana State University to develop one of the most comprehensive and progressive biological weed control programs in the United States. Montana, through support of the NWTF, typically contributes more than any other state toward screening of new insect and pathogen biocontrol agents of weeds (Noweriski 1991).

OTHER RESEARCH

Research projects which have received funds from the NWTF but did not involve biological control with insects include the use of plant pathogens and grazing animals for control of noxious weeds, weed surveys, weed biology, and

environmental impacts from noxious weeds and poisonous plants. Total NWTF revenue expended on these projects was \$315,935 from 1985 through 1990. Projects funded in fiscal year 1991 were not included in the evaluation.

Research was evaluated based on the number of publications resulting from each project. Publications included those reported in professional journals, symposia proceedings, and non-technical journals. Results indicate that 84% of these research projects had at least one publication. A total of 36 publications resulted from 18 projects. A list of publications, by project, is shown in Appendix E.

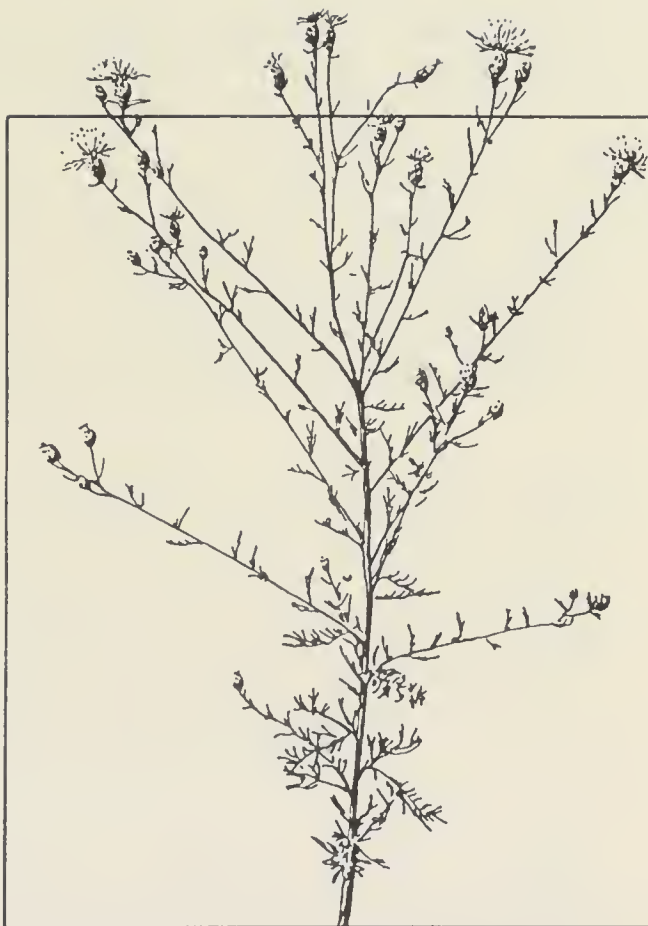
EDUCATIONAL PROGRAMS

Educational programs have been recognized as the key to success of many cooperative group projects. Increased financial support from the legislature for the NWTF grants program and greater emphasis on crop and noxious weed research also indicates that public education programs have been successful.

A total of 34 educational projects on noxious weeds were funded from 1985 through 1991, totaling \$372,145 in NWTF funds. Projects included the state weed fair, spotted knapweed symposium, tours, bulletins, radio and television announcements, and other demonstration/educational programs.

Although it is difficult to measure the relative success or failure of educational programs, several observations were made concerning the impact of these programs in the state. Public support for weed management programs appears to be growing based on the increased number of cooperative group projects submitted to the NWTF. This indicates that more people are becoming concerned about the impact and management of noxious weeds. Support from federal and state agencies for managing weed infestations has also increased since 1985.

AFFECTED ENVIRONMENT



Chapter 4

Noxious Weed Trust Fund

Programmatic Environmental Impact Statement

CHAPTER 4

AFFECTED ENVIRONMENT

NATIVE VEGETATION

The vegetation of Montana consists of plant communities adapted to diverse soils, topography, climate, and biological influences. These communities include coniferous forests at higher elevations of foothills and mountains, shrublands and grasslands in intermontane valleys and plains, and riparian forests and meadows along rivers and streams. Payne (1973) identified 22 native plant communities in Montana based primarily on species composition.

The forest vegetation of western Montana is dominated by Douglas-fir, ponderosa pine, and western larch at moderate elevations, with subalpine fir and lodgepole pine occupying higher and cooler sites. Intermontane grasslands in major river valleys and foothills are dominated by bunchgrasses, such as Idaho fescue, rough fescue, and bluebunch wheatgrass.

Vegetation of central and eastern Montana consists mainly of mixed-prairie grasslands and big sagebrush-grasslands. Dominant plants include blue grama, needle-and-thread, western wheatgrass, threadleaf sedge, prairie junegrass, fringed sagewort, big sagebrush, silver sagebrush, and plains prickly pear.

Riparian vegetation in western Montana typically consists of a forest overstory of black cottonwood with Engelmann spruce or ponderosa pine co-dominating on sites in late stages of ecological development. East of the Continental Divide, the dominant species of riparian plants include plains cottonwood, narrow-leaf cottonwood, green ash, box elder, snowberry, and rose.

There are no plants in Montana listed as threatened or endangered under the Federal Endangered Species Act. However, the Montana Natural Heritage Program has identified rare, endangered, threatened, and sensitive plants and

plants of limited distribution in the state (Shelly and Lesica 1990). Although these plants have no legal status that would require special management or protective efforts on state or private lands, the BLM and USFS have adopted policies to preserve "sensitive" species that are candidates for classification under the federal act.

The Montana Natural Heritage Program considers seven Montana plants to be endangered, 28 to be threatened, and 250 to be sensitive (Shelly and Lesica 1990). Endangered plants are in danger of extinction throughout all or a significant portion of their range in the state. Threatened plants are likely to become endangered throughout all or a significant portion of their range. Sensitive plants have limited populations in Montana or are principally restricted to habitats considered vulnerable to human-caused disturbances. Based on known distribution and habitat characteristics, 25 species considered to be threatened, endangered, or sensitive grow on areas susceptible to invasion by noxious weeds (Table 4-1).

Although native species are the dominant members of most plant communities, their relative abundance and ecological interrelationships have been altered by establishment of transportation corridors, subdivisions, livestock grazing, farming, logging, fire control, and the introduction of exotic plants.

Fifteen exotic plants are currently designated as noxious weeds in Montana. Although nine weed species are well established in the state, spotted knapweed and leafy spurge cause the greatest concern because of their extensive acreages, highly competitive nature, and persistence. Spotted knapweed and leafy spurge currently infest approximately 4.7 and 0.5 million acres respectively (Lacey, C.A. 1987a).

Spotted knapweed is a short-lived perennial that reproduces by seed. It was first reported in

TABLE 4-1

**ENDANGERED, THREATENED, AND SENSITIVE PLANTS
THAT COULD GROW ON AREAS TREATED FOR
NOXIOUS WEED INFESTATIONS**

COMMON/SCIENTIFIC NAME	STATUS
Spring forget-me-not (<i>Myosotis verna</i>)	Endangered
Sapphire rockcress (<i>Arabis fecunda</i>)	Threatened
Trailing fleabane (<i>Erigeron flagellaris</i>)	Threatened
Howell's gumweed (<i>Grindelia howelli</i>)	Threatened
Spalding's catchfly (<i>Silene spaldingii</i>)	Threatened
Idaho barren strawberry (<i>Waldsteinia idahoensis</i>)	Threatened
Narrow-leaf milkweed (<i>Asclepias stenophylla</i>)	Sensitive
Gray's milkvetch (<i>Astragalus grayi</i>)	Sensitive
Obscure evening-primrose (<i>Camissonia andina</i>)	Sensitive
Naked-stemmed evening-primrose (<i>Camissonia scapoidea</i>)	Sensitive
Deer paintbrush (<i>Clarkia cervina</i>)	Sensitive
Common clarkia (<i>Clarkia rhomboidea</i>)	Sensitive
Anderson's larkspur (<i>Delphinium andersonii</i>)	Sensitive
Desert yellow daisy (<i>Erigeron linearis</i>)	Sensitive
Small-headed tarweed (<i>Madia minima</i>)	Sensitive
Great Basin orogenia (<i>Orogenia linearifolia</i>)	Sensitive
Branching phacelia (<i>Phacelia scopulina</i>)	Sensitive
Hot spring phacelia (<i>Phacelia thermalis</i>)	Sensitive
Oregon checker-mallow (<i>Sidalcea oregana</i>)	Sensitive
White-stemmed globemallow (<i>Sphaeralcea munroana</i>)	Sensitive
Spiny skeletonweed (<i>Stephanomeria spinosa</i>)	Sensitive
Poison suckleya (<i>Suckleya suckleyana</i>)	Sensitive
Wooly-head clover (<i>Trifolium eriocephalum</i>)	Sensitive
Hollyleaf clover (<i>Trifolium gymnocarpon</i>)	Sensitive
Twin clover (<i>Trifolium latifolium</i>)	Sensitive
Wooly clover (<i>Trifolium microcephalum</i>)	Sensitive
Longstyle thistle (<i>Cirsium longistylum</i>)	Sensitive

Source: Shelly and Lesica 1990.

Ravalli County in 1920, and has since spread to every county in Montana (Lacey *et al.* 1986). Approximately 83% of the state's spotted knapweed infestations occur in six counties in western Montana, but the plant is rapidly moving eastward. The human role in the spread of spotted knapweed is evidenced by infestations along roads, railroads, powerlines, irrigation canals, and construction sites (MBOGC 1989) (Figure 4-1). Once the plant is established on these disturbed sites, it spreads rapidly onto adjacent lands.

Leafy spurge, like spotted knapweed, is found in every county in Montana. It is a deep rooted, long-lived perennial that is extremely difficult to control. Although leafy spurge will grow under a wide range of environmental conditions (Morrow 1979), it appears to establish and spread most readily along floodplains and small drainages in Montana (Figure 4-2).

GEOLOGY AND TOPOGRAPHY

Montana's diverse topography is the result of earth-forming forces, including faulting, folding, volcanism, and glaciation. Western Montana, separated from the eastern plains by the Rocky Mountains, is typified by two distinct types of mountain ranges. In northwestern Montana, the ranges are long and narrow, extending in a north-south direction. The mountains of southwestern Montana are high-elevation ranges separated by broad, smooth-floored valleys or basins. These intermontane basins, which can be as much as 60 miles long and 30 miles wide, occupy up to 50% of the area (Alwin 1983). The mountains of western Montana include shale, quartzite, limestone, and a variety of igneous rocks; valley bottoms are composed primarily of unconsolidated materials. Elevations vary from 4,000 to over 12,000 feet above mean sea level (AMSL).

The remainder of the state is characterized by rolling prairies dissected by major waterways and ephemeral streams. In northeastern Montana, from the Missouri River to the Canadian border, glaciation has created a landscape dominated by potholes and moraines. Elevations are 2,000 to

3,500 feet AMSL. Rocks in this area are primarily shale and sandstone.

Topography in central and southeastern Montana is more diverse. Sedimentary rocks have been altered by erosion to form badlands, flat-topped buttes, and rugged breaks. Several igneous rock masses have intruded these prairie highlands to form isolated mountain ranges. Elevations range from less than 2,000 to over 11,000 feet AMSL.

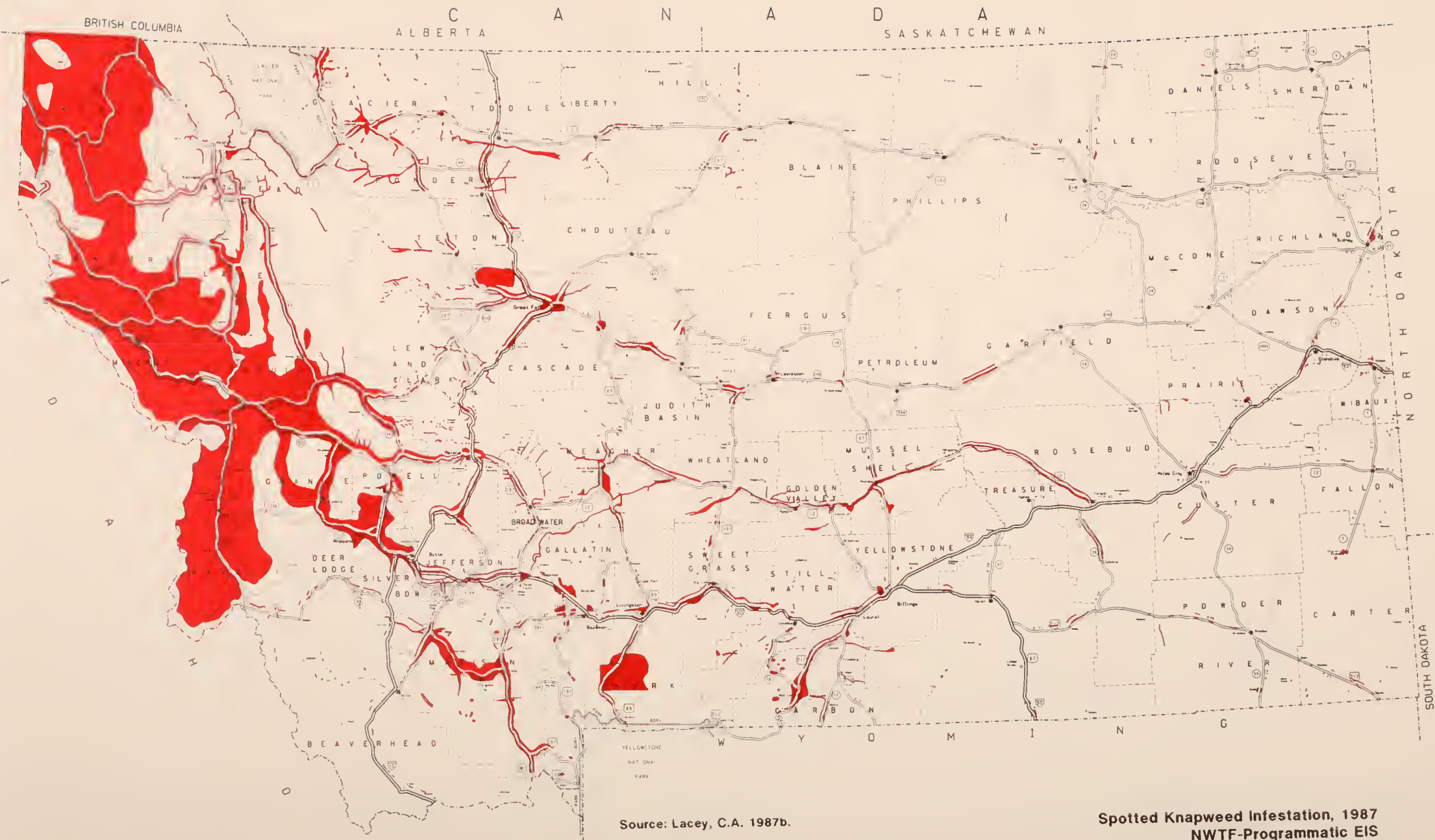
Most noxious weeds in Montana are well adapted to a wide range of environmental conditions. Although there is no direct correlation between the establishment of noxious weeds in Montana and geology or topography, certain landforms support relatively large noxious weed infestations. These areas include the intermontane basins in western Montana, foothill slopes, and floodplains. The relationship between weed density and various land forms is probably the result of increased human activity on these sites.

SOILS

The physical and chemical nature of soils in Montana is determined by parent materials, topography, climate, soil microorganisms, and geological processes. Because these soil-forming factors vary considerably over the state, there is a diversity of soil types. Soils of the semiarid eastern plains differ substantially from those of the coniferous forests in western Montana.

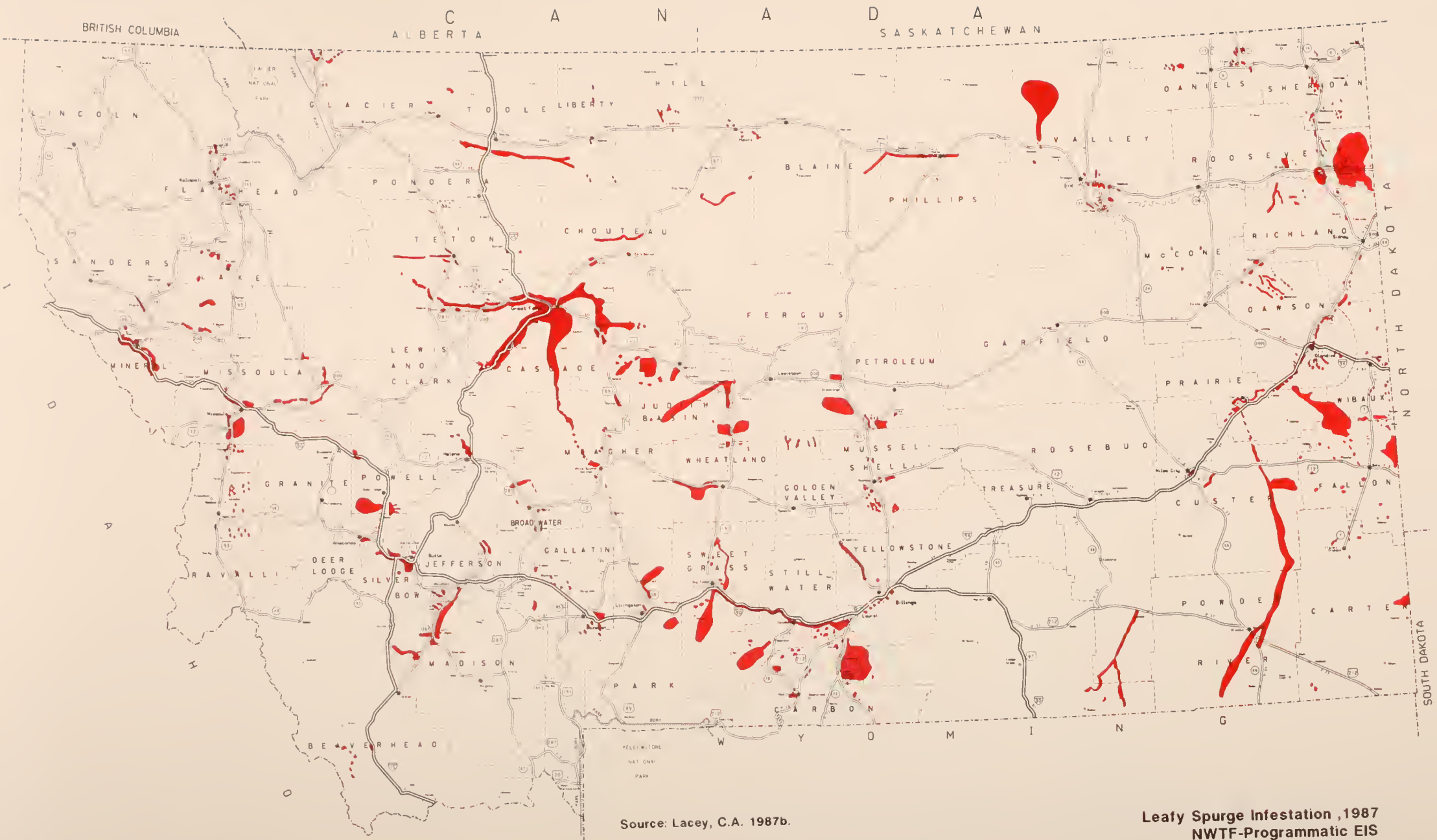
Stream and river valleys or drainage bottoms throughout Montana are composed of alluvium derived from numerous types of parent materials resulting in soils which are normally deep and fertile. East of the Rocky Mountains, soils range from being well developed and fertile to saline, sodic, or both. Soils throughout the state vary widely in texture, structural development, coarse fragment content, and chemical composition.

Soils on forested mountain slopes of western and south-central Montana are often acidic and high in organic matter content. Parent materials are hard, coarse- and fine-grained metamorphic rocks and intrusive and extrusive igneous rocks. Sedimentary parent materials include limestone, dolomite, soft red shales, and hard sandstone.



Source: Lacey, C.A. 1987b.

Spotted Knapweed Infestation, 1987
 NWTF-Programmatic EIS
 FIGURE 4-1



Leafy Spurge Infestation ,1987
 NWTF-Programmatic EIS
 FIGURE 4-2

Soils of the extreme northwestern corner of the state have a pronounced mantle of volcanic ash; this mantle becomes less apparent to the east and south.

Soils on steep, mountainous slopes of western Montana are poorly developed compared with the more stable soils of the plains. Soils of western Montana are "young" associated with cool environments, and are often only 10 to 20 inches thick.

Soils of southeastern Montana are derived from sedimentary shales, claystones, siltstones, and sandstones. They are moderately deep (20 to 40 inches) to deep (more than 40 inches), well developed, and associated with hot, dry prairie environments.

Soils of northeastern Montana are formed primarily from glacial till. The glacial till plain is underlain by and mixed with lesser quantities of soils developed on sedimentary rocks. Sedimentary soils are generally deeper and better developed than soils formed from glacial till.

East-central Montana is glaciated plains and rugged, dissected topography formed from water erosion. Soils are derived from parent materials of sandstone, siltstone, shale, and claystone. These soils are poorly developed due to continuous erosion, and are typical of a hot, dry environment.

Although soil type is often used as one of several environmental factors in rating the susceptibility of a site for weed invasion, there is no direct correlation between specific soil properties and establishment of noxious weeds in Montana. Watson and Renney (1974) found that spotted knapweed could tolerate a wide range of soil chemical and physical factors, and that weed establishment was a function of soil disturbance rather than specific soil properties. Similar findings were also reported for Dalmatian toadflax and leafy spurge. Alex (1964) found that Dalmatian toadflax would establish in soils with a pH of 6.5 to 8.5 and textures ranging from sand to silt loam. Leafy spurge has been observed growing on coarse- to fine-textured soils (Morrow 1979). Although optimum conditions for growth

of purple loosestrife are moist soils of neutral to slightly acid pH, the plant has been observed growing on a wide range of soil textures and types. This suggests that moisture is the most important factor for growth and reproduction of purple loosestrife (Thompson *et al.* 1987).

Numerous soil biological and physical properties can influence the persistence, mobility, and effectiveness of herbicides in a weed management program. These factors include microorganisms, organic matter content, soil texture, coarse fragment content, permeability, available water holding capacity, salinity, cation exchange capacity, slope, and pH. Appendix H gives a more in-depth review of herbicide/soil interactions.

CLIMATE

Montana's climate falls within a broad transition zone between maritime climates to the west and continental climates to the east. West of the Continental Divide, the maritime influence moderates summer and winter temperature extremes, while east of the Divide the continental climate results in short, hot summers and long cold winters. In the mountains, elevational differences strongly affect temperature and precipitation patterns. Annual precipitation ranges from approximately 10 inches to 120-plus inches across the state (USDA, SCS 1981).

In northwestern Montana, most precipitation occurs during winter as snowfall (NOAA 1973). Generally, winter precipitation is associated with moist air masses that sweep inland from the Pacific Northwest. When these air masses collide with the mountains and arctic air masses, precipitation is often heavy on the windward side. Statewide, approximately 75% of spring and summer streamflow comes from melting snowpack (Alwin 1983).

Eastern Montana's rainy season during May and June accounts for 40% of that region's annual precipitation (Cunningham 1982). Precipitation varies widely from year to year, with groups of wet years following groups of dry years in cyclic fashion. Climatologists have noted some predictability to these wet-dry cycles.

Climate has often been viewed as an important factor in determining the establishment and spread of noxious weeds. Harris and Cranston (1979) reported that diffuse knapweed requires an arid period in the summer for germination and establishment. Climatic factors such as length of frost-free season, July temperature, evapotranspiration, and soil temperature have been used to predict the establishment of various weed species (Lindsay 1953). Chicoine (1984) matched soil type, elevation, annual precipitation, evapotranspiration, frost-free season, and July temperature for 116 spotted knapweed infestations with land cover maps to determine acreage susceptible to spotted knapweed invasion in Montana. Results indicated that over 33.9 million acres of range and grazeable woodland are vulnerable to invasion by the weed (Figure 4-3). A computer program utilized similar data to map the potential distribution of dyers woad in the state. Areas susceptible to invasion were projected using soil type, potential evapotranspiration, frost-free season, and precipitation (Nielson 1986) (Figure 4-3).

WATER RESOURCES

SURFACE WATER

Three river systems drain most of the area within Montana; the Clark Fork, the Yellowstone, and the Missouri. Streams west of the Continental Divide flow westward via the Clark Fork River to the Columbia River of Washington and Oregon, eventually discharging into the Pacific Ocean near Portland. The Yellowstone and Missouri rivers drain areas in Montana east of the Continental Divide and flow northward and eastward before joining in western North Dakota. The Missouri River eventually enters the Mississippi River before emptying into the Gulf of Mexico.

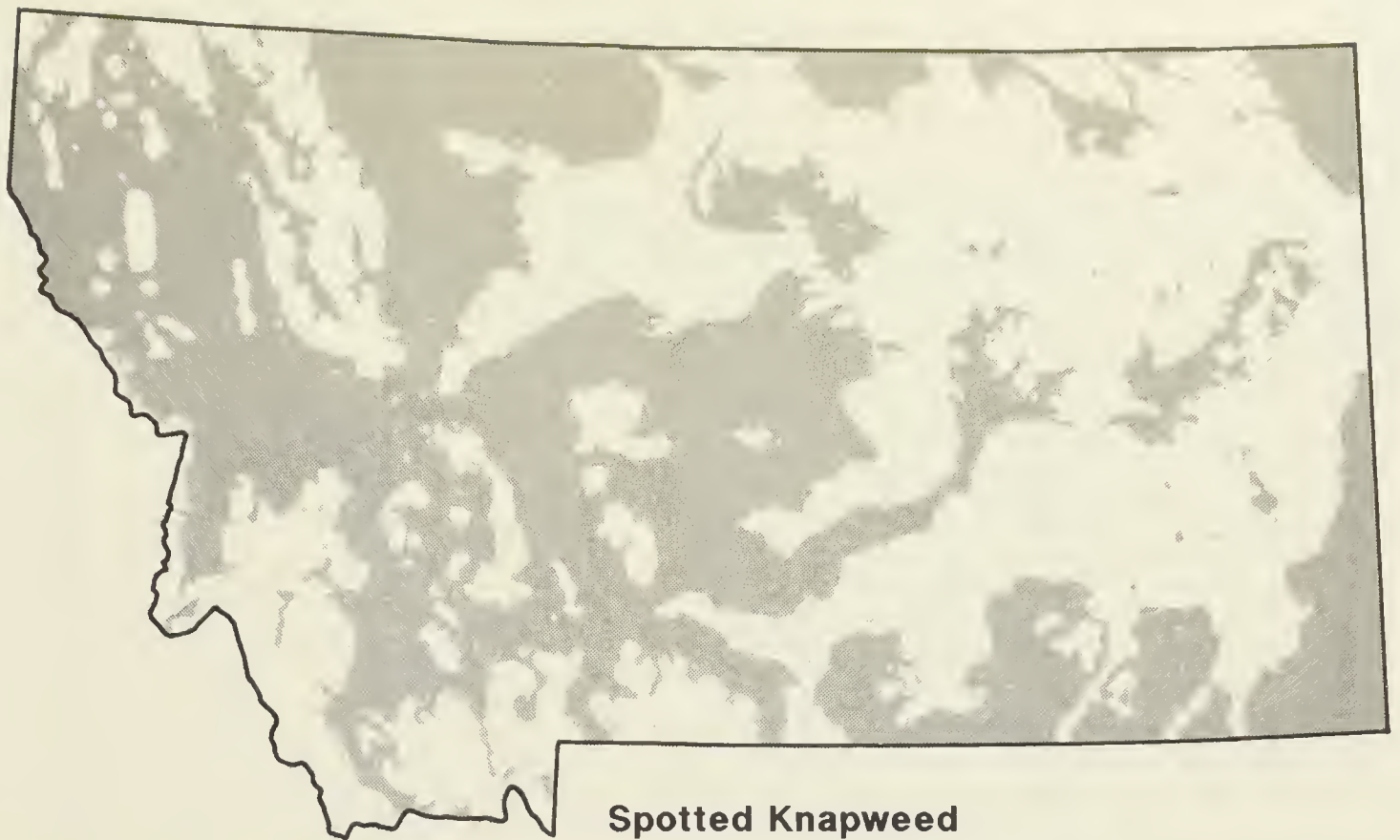
Certain drainages in portions of northwestern Montana drain northward to Hudson Bay (St. Mary River Basin) or westward into Idaho (Kootenai River Basin). Other drainages in extreme southeastern Montana flow directly eastward out of the state and enter the Little Missouri River in southwestern North Dakota.

Figure 4-4 illustrates Montana's surface watercourses. Most streams increase in volume along their courses through the input of tributary flow. Water is commonly extracted for irrigation and domestic purposes.

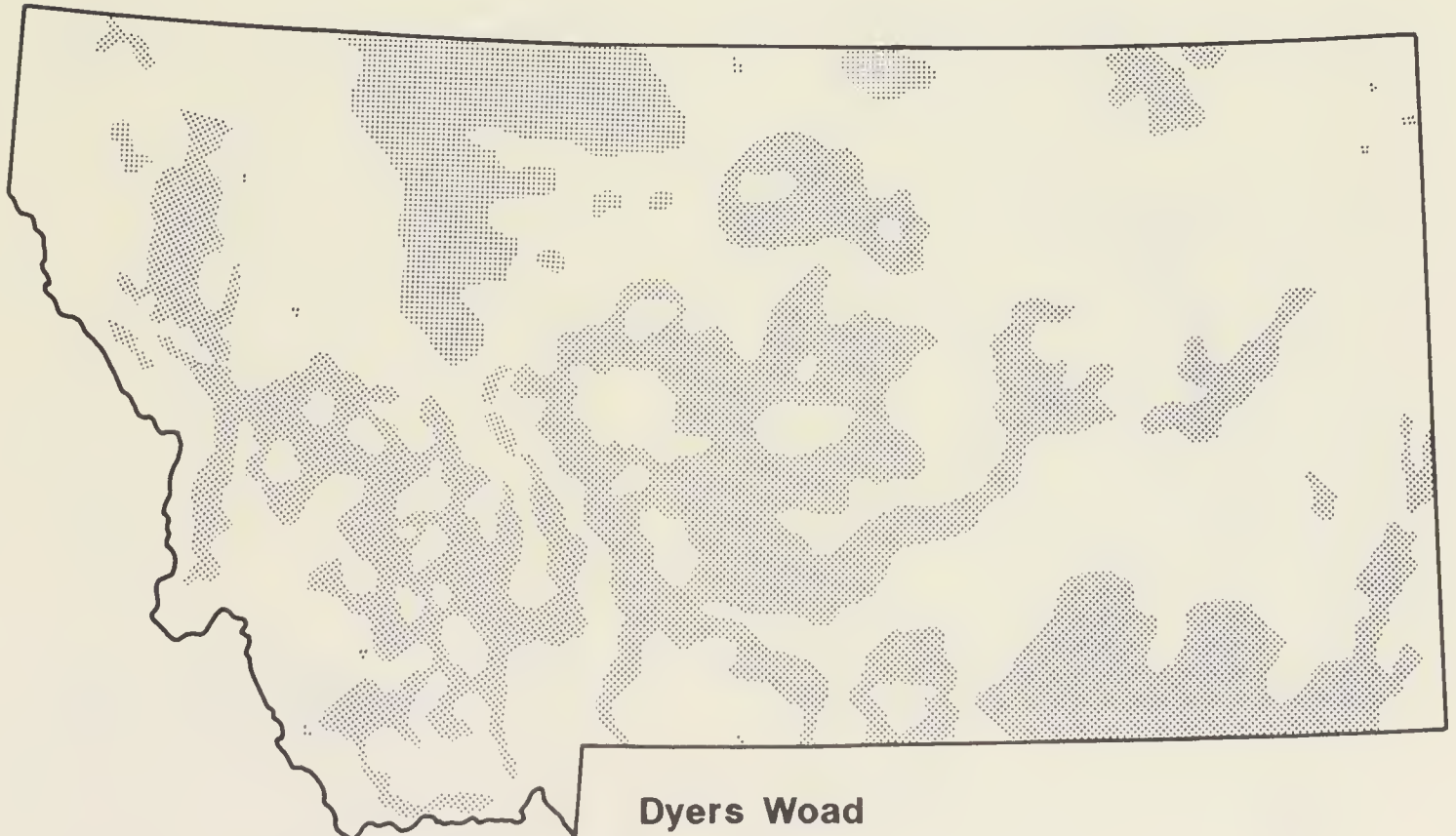
The Clark Fork River exits Montana as the state's largest river. Headwaters of the Clark Fork are in southwestern Montana near Butte and Anaconda and major tributaries include the Blackfoot, Bitterroot, and Flathead Rivers. Average discharge in the Clark Fork River near the Idaho border is 17,620 cubic feet per second (cfs). Recorded extreme flows in the river include a high of 124,900 cfs in 1964 and a low of 60 cfs in 1989 (USGS 1989). A sizable portion of the flow in the Clark Fork River as it exits the state is derived from input of the Flathead river. Several dams have been built on the Clark Fork River to generate hydroelectric power.

The Yellowstone River originates in Yellowstone National Park, Wyoming, flows northeasterly across Montana, and enters the Missouri River near Williston, North Dakota. Major tributaries include the Stillwater, Clark's Fork of the Yellowstone, Bighorn, Tongue, and Powder rivers. Average discharge in the Yellowstone River near Sidney, Montana, is 12,830 cfs. Recorded extreme flows include a high of 159,000 cfs in 1921 and a low of 470 cfs in 1961 (USGS 1989). No dams have been constructed on the Yellowstone. Water is extracted from the river along its course for irrigation and domestic purposes.

The Missouri River, formed by the convergence of the Jefferson, Madison, and Gallatin rivers in southwestern Montana, flows northward and eastward to its confluence with the Yellowstone River. Major tributaries in Montana include the Marias, Musselshell, and Milk rivers. Average discharge in the Missouri River near the North Dakota border is 10,660 cfs. Recorded extreme flows include a high of 78,200 cfs in 1943 and a low of 575 cfs in 1941 (USGS 1989). Several dams have been constructed on the Missouri River to generate hydroelectric power and to supply water for irrigation. The largest area of impounded water is Fort Peck Reservoir in northeastern Montana. Several communities extract domestic water from the river.

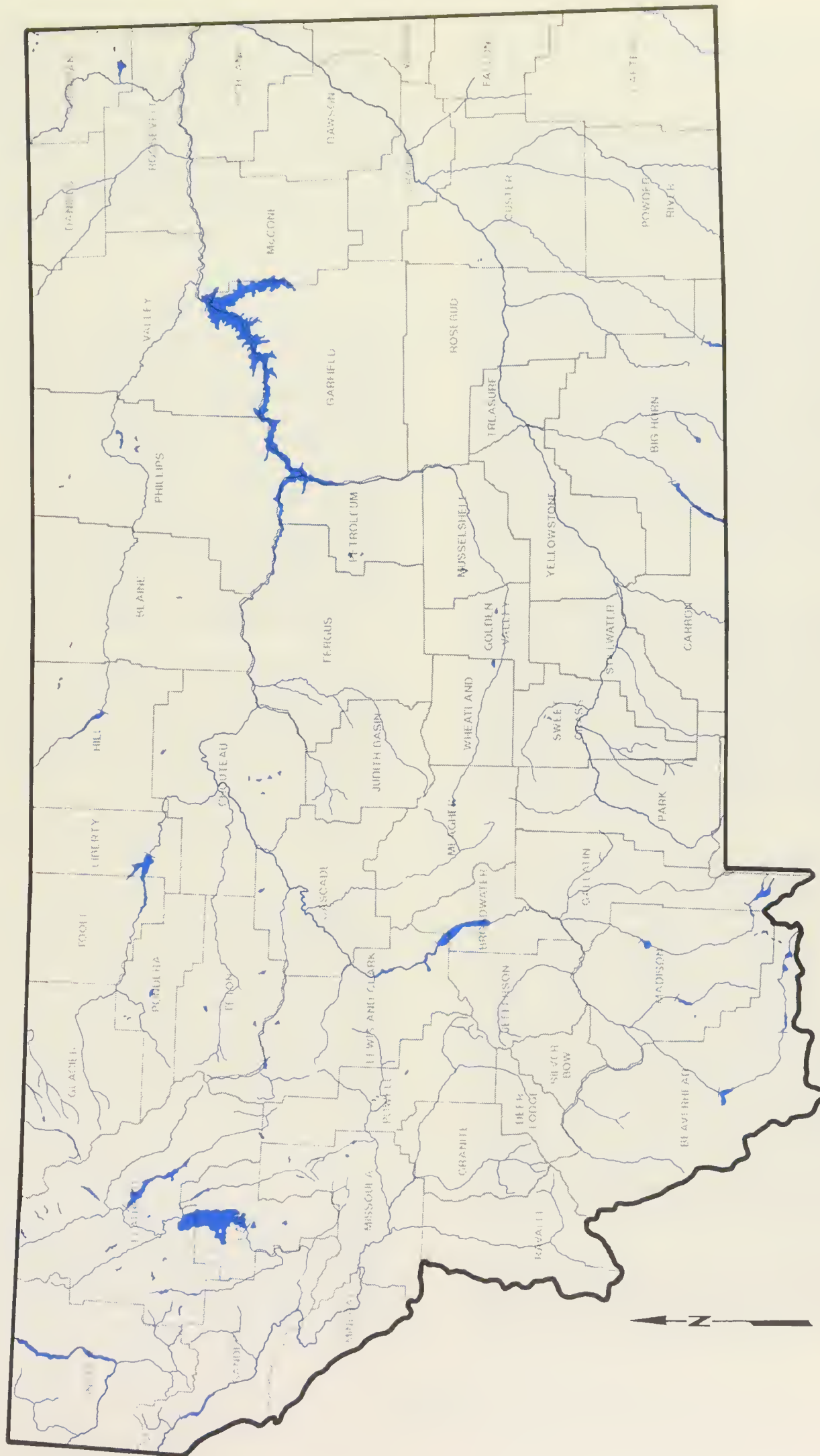


Source: Chicoine, 1984



Source: Nielson 1986 (MSU unpublished data)

**Projected Distribution of Two Noxious Weed Species
NWTF-Programmatic EIS
FIGURE 4-3**



Montana Surface Water Courses
 NWTF-Programmatic EIS
 FIGURE 4-4

The other major watercourse in Montana is the Kootenai River, which enters Montana from Canada and flows westerly into Idaho. Average discharge in the river near the Idaho border is 13,800 cfs. Extreme flows on the Kootenai River include a high of 123,000 cfs in 1948 and a low of 996 cfs in 1936 (USGS 1989). Libby Dam, constructed to generate hydroelectric power, controls flows on a large portion of the river in Montana.

Many of the major tributaries in Montana are infested with noxious weeds, including leafy spurge and spotted knapweed, and face a serious threat from purple loosestrife. Infestations of leafy spurge occur along the Yellowstone, Madison, Smith, Missouri, Powder, Milk, Marias, and Boulder rivers. The ability of leafy spurge seeds to float and germinate in water (Bakke 1936) appears to be advantageous for establishment of the plant along water channels and areas that are occasionally subjected to flooding (Selleck *et al.* 1962). Flooding and scouring effects benefit noxious weed establishment along tributaries.

The quality of surface water in Montana varies widely by location. Because mountainous areas receive large amounts of precipitation, mountain streams typically contain abundant quantities of high-quality water. Much less precipitation falls on the eastern plains of Montana, and as a consequence, less fresh water is available to recharge surface water systems.

Stream classifications have been developed by the Montana Department of Health and Environmental Sciences (MDHES) for every major river and tributary in the state. MDHES has adopted standards to limit the amounts of various pollutants that can be released into surface water. The various water quality standards for each stream class are established by administrative rules of the MDHES (ARM 16.20.601 *et seq.*).

GROUND WATER

Occurrence, quality, and movement of ground water in Montana depends on site-specific factors such as geology, topography, and climate. Water-bearing formations in the state can be di-

vided into two broad classes--unconsolidated aquifers and consolidated aquifers.

Unconsolidated deposits in Montana are generally associated with stream action (alluvial deposits), mass-wasting processes (colluvial deposits), or deposits formed as a result of glacial activities. These deposits of sand, silt, clay, gravel, and boulders reach their most extensive development in intermontane valleys, where thicknesses may approach several hundred feet. Thicknesses of these unconsolidated aquifers outside the intermontane valley systems typically range from 10 to 100 feet. Alluvial and glacial unconsolidated deposits are frequently more extensive than deposits associated with mass-wasting processes. Coarse-grained, well-sorted deposits usually have high rates of water movement (dozens of feet per day), while fine-grained, poorly sorted deposits have low rates of water movement (one to several feet per day).

Ground water recharge in unconsolidated materials is generally a result of precipitation, snowmelt, and influent streams, while discharge is primarily from wells, effluent streams, evapotranspiration, leakage, and springs. Small distances may separate areas of recharge and discharge. Generally, recharge and discharge volumes in unconsolidated aquifers are more than those in consolidated aquifers.

In general, water quality in Montana's alluvial aquifers is good. However, in some cases, ground water quality is below the relevant drinking water standards established by the MDHES. The severity of existing impacts to ground water in Montana depends on the hydrogeologic setting, the type and volume of contaminants, and the existing and future beneficial uses of ground water. Sources of ground water contamination include underground storage tanks, injection wells, septic tanks, miscellaneous spills and uncontrolled releases, abandoned hazardous waste sites, mineral processing, agricultural activities, and natural sources of poor quality water (MDHES 1990).

Rocks ranging in age from Precambrian to Tertiary (sedimentary, igneous, and metamorphic) also form water-bearing units or consolidated

aquifers in Montana. Water movement in some of these formations takes place within the void portion of the original rock fabric. In other formations, extensive alteration of the original rock texture through the development of fractures, fissures, joints, and cavities has markedly increased the original capacity of the rock to transmit or store water.

Water occurrence and movement in these deposits is often highly variable. In many bedrock systems, the amount of ground water moving through the bedrock is low relative to unconsolidated deposits. However, the rate of ground water movement through bedrock can be relatively fast.

Because the size of pore spaces in bedrock systems are typically small, and the volume of water moving through bedrock is small relative to unconsolidated deposits, limited attenuation and dilution of contaminants occurs.

Pesticides have been identified in ground water in Montana (DeLuca *et al.* 1989) with measured concentrations that were well below the relevant drinking water standards. These pesticide residues may have stemmed from either point sources (spills, uncontrolled releases, etc.) or non-point sources (pesticide applications). A more specific discussion can be found in Chapter 6.

WILDLIFE

Wildlife habitats in Montana, ranging from the western mountains to the rolling prairies of the eastern plains, support a diversity of species. The 502 species of mammals, birds, and reptiles in Montana provide the public with aesthetic, recreational, and economic opportunities (MBOGC 1989).

Big game species include mule and white-tailed deer, elk, moose, antelope, bighorn sheep, mountain goat, and black and grizzly bears. Intermontane valleys and foothills in the Rocky Mountains provide winter range for mule deer, white-tailed deer, and elk. Mule deer and elk typically migrate to lower elevations when snow becomes deep in the mountains. Winter range in

mountainous areas exists in narrow bands, bounded by high snowfall areas above and urban and agricultural activities in the valley bottoms below. Winter range is the most important seasonal habitat because it is limited in area and has been eliminated or reduced by competing land uses. These winter range sites are very susceptible to invasion by noxious weeds and additional degradation of wildlife habitat.

Birds of prey (raptors) such as hawks, owls, falcons, and eagles are found in all habitats throughout the state. Waterfowl breed and migrate through all of Montana, but are especially abundant in the glaciated pothole areas in the Flathead Valley and in eastern Montana north of the Missouri River.

Montana's 80 species of fish are adapted to both cold waters of western Montana and warmer waters of the eastern part of the state. Salmonid fish (i.e., trout, salmon, grayling, and whitefish) are the dominant species in cold lakes and streams in the western part of the state. Most rivers, streams, and lakes in eastern Montana support species adapted to cool and warm water. The fish most popular with anglers are sauger, walleye, northern pike, bass, channel catfish, burbot (ling), and paddlefish.

Currently, nine wildlife species found in Montana are classified under the Federal Endangered Species Act of 1973 as either endangered or threatened. Endangered species are those determined to be in danger of extinction throughout all or a significant portion of their range, whereas threatened species are likely to become endangered in the foreseeable future. Endangered species in Montana are the peregrine falcon, whooping crane, gray wolf, black-footed ferret, bald eagle, least tern, and pallid sturgeon. The grizzly bear and piping plover are classified as threatened. Habitat destruction and loss of individual animals could lead to extinction of threatened and endangered species.

LAND USE

Agriculture is the dominant land use in Montana. About two-thirds of the state's agricultural land is rangeland and pasture that supports the livestock

industry. Cropland constitutes about one-third of the agricultural land in the state. Land ownership in Montana is comprised of 29.5% federal lands, 2.4% Indian-owned lands, 5.9% state-owned lands, and the remaining 62.2% is privately owned or rights-of-way (MDA 1990b).

Farms and ranches across Montana vary in size from a few thousand acres to many thousands of acres. In many areas, farming and livestock ranching are practiced in almost equal proportions. The "Golden Triangle" in north-central Montana is the most densely settled rural area and the most productive dryland grain farming area in the state (Alwin 1983). Agricultural development has been linked with the establishment and spread of noxious weeds since the days of the early homesteaders.

The forest lands of western Montana constitute 3.1% of the total land base in the state and are basic to the economy. With a combined area of approximately 16 million acres, western Montana's 10 national forests supply about half the region's wood products, with the remainder coming from privately-owned timberlands. Extensive road construction, off-road travel, and other surface disturbances have accelerated the spread and establishment of spotted knapweed on forest lands.

In many areas, rural populations are increasing and rural land has been progressively cleared and subdivided. There is an increasing tendency for urban workers to settle on small farms or lots within commuting distance of urban centers. Rural subdivisions and second homes now occupy land that was once undeveloped and used for agricultural purposes. This pattern of settlement is a major contributing source to the weed problem in Montana.

AIR QUALITY

Air quality in Montana is generally good. Some valleys suffer from frequent temperature inversions, particularly in winter, when topography and climatic conditions restrict air dispersion. Air pollution is controlled through ambient air quality and emission standards and permit requirements

established under the federal Clean Air Act and the Montana Clean Air Act (MDHES 1980).

There are two types of air quality standards: primary standards, established at levels to protect human health, and secondary standards, set at levels to protect property, livestock, and vegetation (Montana Clean Air Act, 75-2-101, MCA). The State of Montana maintains primacy for implementation of federal air quality programs. The Clean Air Act Amendments of 1977 contain provisions to ensure that air quality does not deteriorate in areas with clean air. Class I standards, which apply to national parks and wilderness areas, allow virtually no deterioration. Most of Montana falls under Class II, which allows moderate deterioration of air quality.

CULTURAL RESOURCES

Cultural resources include physical evidence left by past societies, both historic and prehistoric. Cultural resources also include locations of events with no accompanying physical evidence. Any surface-disturbing activity on state or federal land requires that consideration be given to historical and archaeological resources.

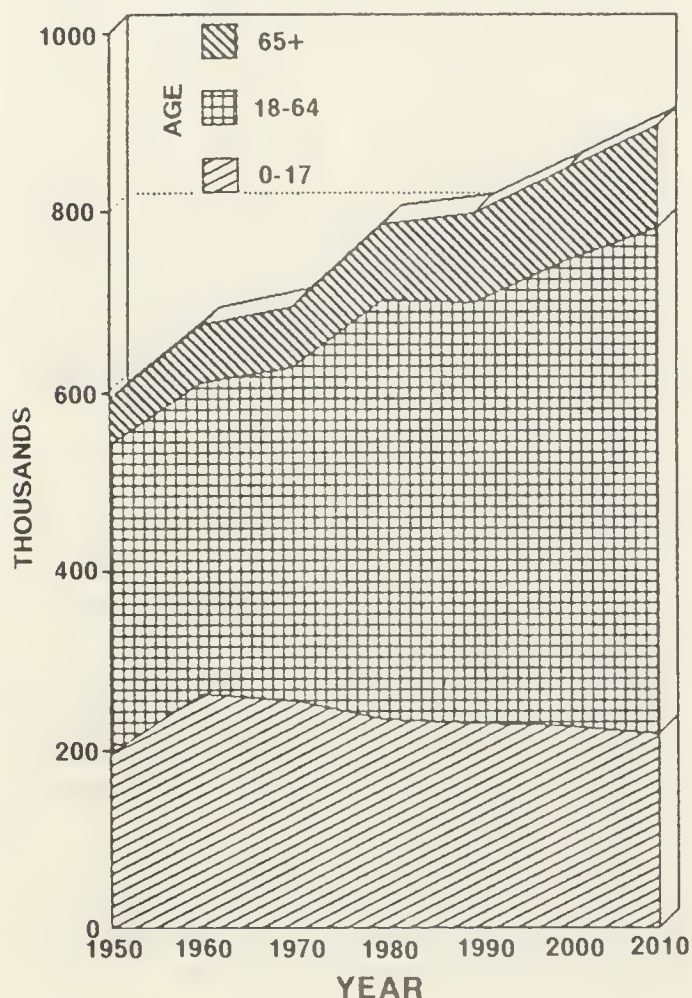
Prehistoric (archaeological) cultural resources are those associated with human habitation dating from about 12,000 years ago, the time of human migration to the western hemisphere. The historic period began in 1492, when Europeans arrived in North America and introduced Euro/American culture. Approximately 28,000 archaeological and historical sites have been recorded in Montana; however, only about 10% of the state has been surveyed for cultural resources (MBOGC 1989). A small number of cultural sites have been evaluated for inclusion on the National Register of Historic Places.

SOCIOECONOMIC CONDITIONS

ECONOMIC CONDITIONS

Between 1950 and 1990, the population of Montana grew sporadically, expanding with economic growth in the 1950s and 1970s and stabilizing with economic downturns in the 1960s

and 1980s (Figure 4-5). The overall growth rate from 1970 to 1990 was 15.1%, with over 95% of this growth occurring in the 1970s (USDC, BC 1940-90).



Montana Population
Past and Projected
NWTF-Programmatic EIS
FIGURE 4-5

Following the national recession in 1982 and subsequent declines in energy exploration and wood products manufacturing, Montana experienced a net out-migration of its population in every year from 1984 to 1990 (USDC, BC 1981-85). In 1980, there were 23,800 farms in Montana with a related farm population of 67,546. Since that time, the number of farms has remained fairly stable; however, the farm population has declined (MDA 1990b).

Baseline population and economic projections for Montana (Figure 4-5) were developed by National

Planning Association, Data Services Inc. (NPA) of Washington, D.C. From 1990 to 2010, the population of Montana is expected to grow at about the same rate as it did from 1950 through 1990. By 2010, NPA projects the population of Montana to total 913,730, approximately 14% more than the 1990 census. The makeup of the population should be significantly different, however, with a smaller percentage of young people and higher proportion of people of retirement age (Figure 4-5).

Employment in Montana has increased 43% since 1970, with most new jobs occurring in the private sector (USDC, BEA 1990). Specifically, of the estimated 95,000 new jobs created in Montana since 1970, 30,000 were in the services sector and 19,000 were in the retail trade sector. The number of farm-related jobs in Montana has decreased nearly 18% since 1970. This decline also has caused secondary impacts in the agriculture services sector and other service and retail trade sectors throughout the state.

Employment in Montana is projected to increase by 95,000 jobs by the year 2000 (Figure 4-6) (NPA 1990). Private-sector jobs are expected to increase at about the same rate as during 1970-90, while government jobs should mirror the 1980-90 growth rate. Farm jobs are expected to continue a downward trend and should total approximately 22,300 jobs by 2010.

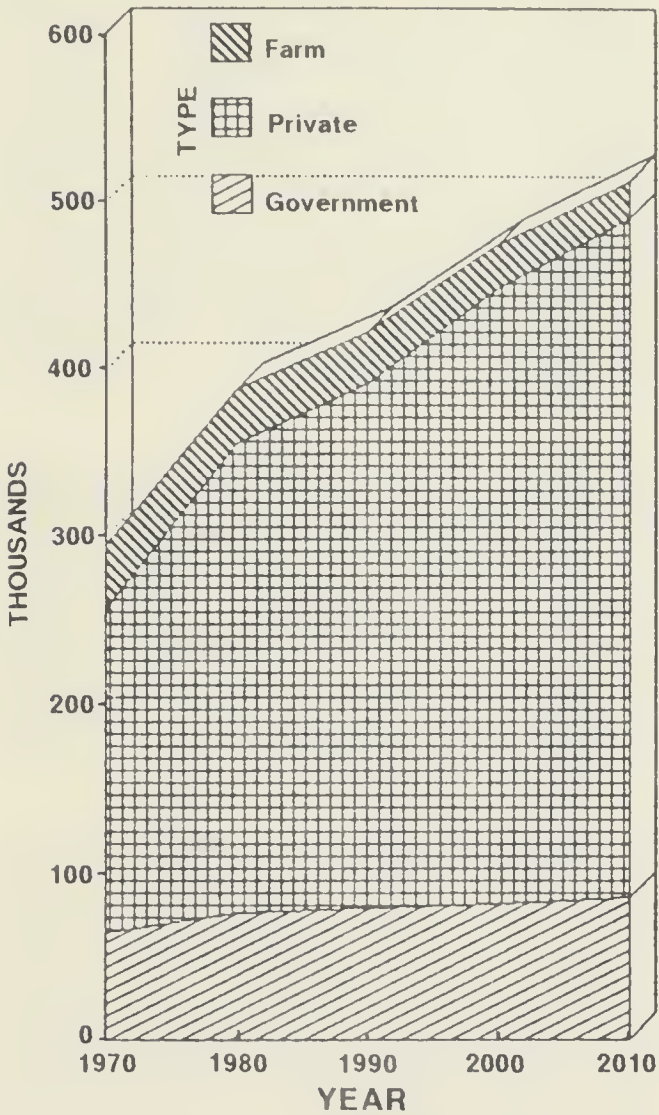
Since 1970, per capita personal income in Montana has declined when compared with the United States average (Figure 4-7) (USDC, BEA 1990). In 1989, per capita income in Montana was \$11,694, approximately 82% of the United States average of \$14,175. This difference is projected to decrease somewhat by 2010, when state per capita income should equal \$18,776, or 91% of the projected United States average of \$20,600.

Agriculture is the primary industry in Montana, accounting for about 40% of the total farm receipts generated in the state (MDA 1990b). In 1989, farm income constituted approximately 5% of total personal income in Montana. In 1990, agricultural marketings, including government payments, totalled \$1.9 billion, with 45% (\$864

million) from livestock and products and 39% (\$742 million) from crops. Principal livestock receipts came from the sale of cattle and calves (84% of livestock products), while primary crop receipts were realized from wheat and barley (76% of crop products).

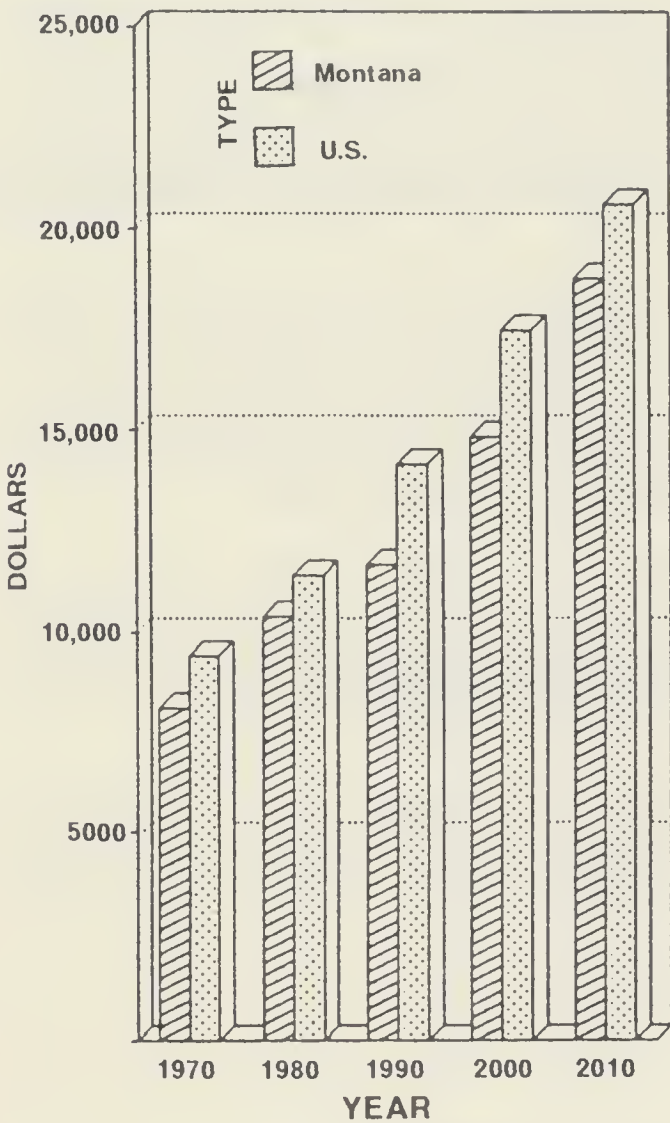
\$47 million per year (Lacey 1986). In addition, noxious weed infestations may result in decreased land values.

Private and government efforts to curb weed infestations and spread have resulted in economic benefits through increased agricultural production, higher land values, and improved recreational opportunities (primarily hunting). Further direct economic benefits are realized through local purchases of chemicals and the cost of application. The NWTF grants program provides over \$1.2 million per year in grants with approximately 60% going directly into local efforts to control weed infestations.



Montana Employment
Past and Projected
NWTF-Programmatic EIS
FIGURE 4-6

At present, noxious weeds infest an estimated 8.5 million acres in Montana (Lacey 1986). The major economic impact from noxious weed infestation is on grazing lands and wildlands, where impacts result not only from lower levels of income from livestock products, but also from loss of wildlife habitat and reduced recreational opportunities. It is estimated that poisonous plants and noxious weeds on rangeland cost the state approximately



Montana and U.S.
Per Capita Income
NWTF-Programmatic EIS
FIGURE 4-7

SOCIAL LIFE

The social character and perceptions of Montanans are influenced by region of the state, occupation, ethnic background, education, population density, and numerous other factors which affect how people interact among themselves and their environment. Montana residents highly value the natural environment and the amenities that it provides, such as outdoor recreation, scenery, photography, wildlife viewing, hunting, fishing, wood gathering, and berry picking. Employment opportunities are limited and earnings are low when compared to other parts of the country, perhaps reflecting a quality-of-life premium that residents are willing to pay to live in Montana.

Life-styles of residents are influenced by their use and perceptions of the land, plant communities, wildlife, and waters. In general, two major groups can be identified relative to familiarity and concern over noxious weeds, noxious weed control, and the NWTF program--urban and rural residents.

Many rural residents, farmers, ranchers, and small landowners, come into contact with noxious weeds and their control routinely in their business. As a result, they often view noxious weeds as a direct economic problem requiring some type of control action. Rural residents are generally aware of the NWTF program.

Urban and suburban residents usually do not work as closely with the land and may not know the state's noxious weeds. Most urban residents probably are not aware of the NWTF or its role in noxious weed control in the state.

Many urban residents are less familiar with noxious weeds, noxious weed control, and actual risks posed to human health and the environment

by pesticides. Whether the potential to threaten the environment or affect human health is real or perceived, some residents are opposed to the use of herbicides for weed control.

RECREATION AND VISUAL QUALITY

Montana offers a wide variety of outdoor recreational opportunities. These can be grouped into four major activity categories: travel- and nature-based, water-based, winter, and organized games and sports. Specific activities include hunting, sightseeing, camping, picnicking, hiking, biking, horseback riding, off-road vehicle use, swimming, river floating, boating, fishing, snowmobiling, skiing, and skating, among others. Recreational activities occur at both developed and dispersed sites.

Montana's visual resource is based on the scenic quality of landscapes and the public's perception of those landscapes. The elements that constitute the visual resource include form, line, color, and texture. For any landscape or vista, a combination of these elements defines the distinctiveness of the resource. Topography, climate, vegetation, wildlife, and geology all contribute to a montage of visual elements.

Several species of noxious weeds were introduced as ornamentals because of their showy flowers. In particular, Dalmatian toadflax, with its bright yellow snapdragon-shaped flower, may add to the appeal of a landscape when viewed during the flowering season. The purple flowers of spotted knapweed may also be pleasing to some viewers. The relative importance of these plants with respect to other flowering vegetation cannot be quantified, however, when an entire vista or landscape is taken into consideration.

PROGRAM ALTERNATIVES



Chapter 5

Noxious Weed Trust Fund

Programmatic Environmental Impact Statement

CHAPTER 5

PROGRAM ALTERNATIVES

ALTERNATIVE 1 NO ACTION – CONTINUATION OF THE EXISTING NOXIOUS WEED TRUST FUND PROGRAM

This alternative provides for continuation of the NWTF program in the same manner as it is presently administered by the MDA. A full description of the program elements are contained in Chapter 3.

ALTERNATIVE 2 GENERAL ADMINISTRATIVE MODIFICATIONS TO THE EXISTING PROGRAM

Modifications to the existing program under this alternative would include the following:

GRANT APPLICATION REQUIREMENTS - NWTF

- ◆ The project development guidelines and application form would be revised to require additional information for specific resources to comply with the Montana Environmental Policy Act (MEPA) and the NWTF rules. The environmental information required of the applicants would depend on the type of weed control methods to be utilized. The following general categories would be developed for baseline information for grant applications:

1. Education and/or Research Programs

Grant applications which seek funding for educational or research programs would not be required to submit existing environmental information in support of the projects. Projects which propose education and research activities do not constitute actions

which pose threats or have the potential to impact the human environment as defined under MEPA.

2. Non-Chemical Weed Control Programs

Non-chemical weed control program proposals would require that the applicant provide a topographic map of the project area showing water courses, vegetation types, cultural/historic features (if tilling or burning is proposed), and soil types. This information, coupled with the description of the proposed project would be sufficient for the MDA to determine compliance with MEPA and NWTF rules.

3. Chemical Weed Control Programs

Grant applications which propose using chemical weed control methods would provide environmental information in sufficient detail to allow MDA to evaluate the project under the rules of the NWTF and MEPA. Environmental baseline information to be provided by the applicant or the MDA may include the following:

- a. Topography -- topographic maps of the project area (1:24,000 suggested).
- b. Soils -- type, quality, quantity.
- c. Water Resources -- surface watercourses (map depiction); ground water information including depth to ground water; location of springs, domestic water supplies, existing wells and, wetlands (map depiction); and water use.
- d. Terrestrial, Avian, and Aquatic -- general description of big game use of the project area, including critical habitat (i.e., calving areas, winter range); presence of avian

species of concern such as bald eagles, peregrine falcons, or other listed species from the Natural Heritage Program; and streams with high fisheries value.

- e. Vegetation -- general description of vegetation in the project area (i.e., range lands, grasslands, forest lands); dominant species in the project area.
- f. Historical and Cultural Resources -- known location, National Register of Historic Places.
- g. Land Use -- delineation of agricultural lands, industrial lands, and commercial lands.

4. Integrated Management Programs

Grant applications which propose the use of an integrated management program would be required to provide the environmental information commensurate with the individual elements of the integrated program. For example, the portion of the program which utilizes non-chemical weed control methods would follow the environmental information requirements of part 2 above. The chemical weed control methods portion of the program would follow the environmental information needs of part 3 above.

MONTANA ENVIRONMENTAL POLICY ACT REVIEW - MDA

- ◆ An environmental review document would be completed by the MDA for each grant application received to ensure compliance with MEPA. This document would replace Form NW1003 currently in use by the MDA. Should more information be needed by MDA regarding existing site conditions in order to complete the environmental review of the overall noxious weed control plan, MDA would notify the applicant and identify the specific informational needs. The environmental document prepared for individual grant applications can take one of three forms: an Environmental Checklist, Environmental Assessment, or Environmental Impact State-

ment. The form of the environmental document would depend on the proposed weed control methods, the areas in which the project is to take place, and the significance of impacts associated with the project.

- ◆ The following general categories of environmental documentation would apply to the grant application review:

1. Education or Research Programs

Grant submittals which provide for education or research projects would be categorically excluded from the requirements of MEPA.

2. Non-Chemical Weed Control Programs

Environmental review for projects comprised solely of non-chemical weed control methods would typically entail completion of an environmental checklist. For circumstances where it is determined that the MDA's decision process must be more fully discussed or specific mitigations may be required prior to grant approval, an Environmental Assessment may be required.

3. Chemical Weed Control Programs

Environmental review for projects incorporating the use of chemical weed control methods may range from completion of an environmental checklist to preparation of an EIS. The selection of which environmental review document is required is a function of whether the proposed project would have a significant impact on the environment. The MDA would review the proposed project within the context of the environmental information and determine the significance of impacts which may result from implementation of the project. If the MDA determines that a particular project or portion of a project would have a significant impact, the applicant will have the opportunity to modify the proposal to mitigate the identified impacts. Should the applicant revise the plan to mitigate the identified impacts, the MDA could select an environmental review document commensurate with the modified project.

4. Integrated Management Programs

Projects proposing to utilize an integrated management program approach for weed control are, in theory, designed to mitigate environmental affects associated with noxious weed control. However, the MDA is still responsible for determining compliance with MEPA. The elements of the integrated management program would be reviewed in the context of the project area and the appropriate environmental review document would be completed by the MDA.

- ◆ MDA would expect a level of training of all pesticide applicators within project areas commensurate with current EPA training and certification standards.
- ◆ MDA would request copies of county audits conducted by the Department of Commerce (DOC) on a routine basis. The audits provided by DOC will form the basis for MDA's review of expenditures of NWTF funds.
- ◆ Field evaluations and site visits would be conducted by MDA staff for each project at least once during the project life. Site visits would provide information on the success or failure of weed control methods and document environmental effects (if any) resulting from the project. A copy of the evaluation would be given to the project sponsor and a copy would be filed in MDA's project file.
- ◆ The Montana Noxious Weed Trust Fund activities summary report would be compiled annually and expanded to include a brief synopsis reviewing the effectiveness of completed projects. Special attention would be given to reporting on weed control research and management practices in environmentally sensitive areas.

ALTERNATIVE 3 DISCONTINUATION OF THE NWTF PROGRAM

Implementation of alternative 3 would require legislative action to authorize cessation of the

NWTF program. The trust fund monies which have accrued in the program would be distributed to the counties in accordance with rules to be promulgated by the MDA.

ALTERNATIVES CONSIDERED BUT DISMISSED

ALTERNATIVE--EXPANSION OF THE EXISTING NWTF PROGRAM

This alternative would expand the existing NWTF program to a level commensurate with the increase in the noxious weed infestation in Montana. In order to develop the expanded program, updated maps of the noxious weed infestation would be needed. The data would be used to match the scale of the expanded grants program to the predicted and observed infestation rates. Once the spread of noxious weeds is contained, the grants program would be scaled back to match the control effort required to achieve eradication.

This alternative was dismissed because funding is not sufficient to support an expanded program. This alternative would also require legislative authorization. In addition, the issue of expanding noxious weed control statewide would be more appropriately addressed by a programmatic review of the County Noxious Weed Control Act. Such review would include an analysis of the relationship between noxious weed infestations and the effectiveness of control methods.

ALTERNATIVE--GRANTS PROGRAM FUNDS UTILIZED TO SUBSIDIZE COUNTY WEED PROGRAMS

This alternative would discontinue the existing grants program and divert the funds to individual counties to provide a base funding for weed districts.

This alternative was dismissed in recognition of the original intent of the NWTF program, which was to provide cost-share money to support statewide cooperative weed management projects, weed research, and educational programs.

DIRECT, INDIRECT, AND CUMULATIVE IMPACTS



Chapter 6

Noxious Weed Trust Fund

Programmatic Environmental Impact Statement

CHAPTER 6

DIRECT, INDIRECT, AND CUMULATIVE IMPACTS

The purpose of this section of the PEIS is to review direct, indirect, and cumulative impacts of the NWTF grants program. Since this is a Programmatic EIS, direct impacts are those associated with administration of the program and indirect impacts are those associated with various noxious weed control methods.

Three alternatives are discussed in this section of the PEIS:

Alternative 1 -- No Action -- Continuation of the existing NWTF program.

Alternative 2 -- General administrative modifications to the existing NWTF program.

Alternative 3 -- Discontinuation of the NWTF program.

DIRECT AND INDIRECT IMPACTS

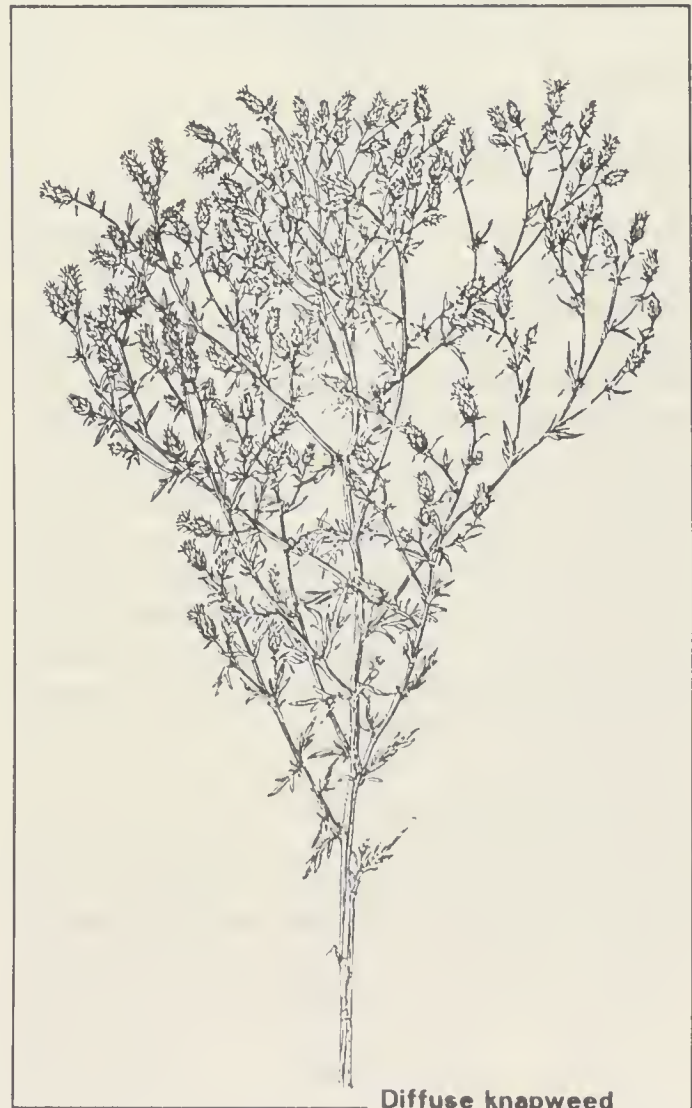
ALTERNATIVE 1 -- NO ACTION -- CONTINUATION OF THE EXISTING NWTF PROGRAM

DIRECT IMPACTS

The MDA's authority for administration of the NWTF is established by the Montana Noxious Weed Trust Fund Act. This authority is generally limited to requiring sufficient information from applicants to comply with the NWTF act and requiring project sponsors (applicants) to report project progress and effectiveness.

Direct impacts which can be attributed to the existing administration of the NWTF program are limited to economic impacts and potential future liability for the State of Montana. Both of these impacts are associated with the potential for environmental degradation resulting from noxious weed control methods.

Potential future liabilities for the State of Montana associated with projects funded by the NWTF program are not quantifiable. Present administration of the program provides for indemnification of the state from the grantee, which allows the MDA to secure funds from the grantee (county) in the event the State of Montana is judged liable in settlement of a lawsuit. Should the MDA or the state be held responsible for environmental damages incurred as a result of projects funded by the NWTF, a substantial economic impact could result; the cost to the state would depend on the grantee's (county's) ability to pay.



Diffuse knapweed

INDIRECT IMPACTS

Indirect impacts are those associated with the management of noxious weeds. Projects supported by the NWTF have resulted in reducing environmental and economic effects caused by weeds in the state (Chapter 2). Examples include protecting native vegetation (including rare and threatened plants) from the spread of weeds, educating the public about weeds and weed management, accelerating the biological control effort, increasing forage production for livestock and wildlife, and reducing soil erosion and surface runoff caused by dense infestations of tap-rooted weeds.

There have been no documented adverse indirect environmental impacts associated with various weed control methods used under the existing NWTF program. However, continuation of the program as it is presently being administered increases the potential for impacts to occur. Potential environmental consequences of each treatment method are evaluated below.

Vegetation

Herbicide Treatments

Herbicides, such as 2,4-D, clopyralid, dicamba, and picloram, are selective for certain broadleaf shrubs and forbs, but have little or no effect on grasses and grass-like plants. Consequently, areas treated with these herbicides would have a decrease in broadleaf plants and increased production of grasses. Rate and timing of application will determine the selectivity of a herbicide on non-target tree, forb, and shrub species. Picloram and clopyralid, applied at rates recommended to control spotted knapweed, have been shown to selectively remove the weed without damaging many other forb species (Lacey, C.A. et al. 1989).

Other Treatment Methods

Mechanical weed treatment or prescribed burning to control weeds could potentially impact non-target vegetation. Most mechanical methods,

other than manual weed pulling, would affect both target and non-target plants. Manual weed pulling would have little or no impact on non-target species.

In general, burning promotes regeneration of most grasses and forbs, but would selectively eliminate certain shrubs and trees (USDI, BLM 1985). Most plants regenerate rapidly after fire. Although burning has little effect on noxious weeds, it may be used as a set-up treatment to reduce standing litter, allowing improved herbicide penetration.

Biological methods of weed control could include grazing animals, insects, and microbial pathogens. Grazing animals, such as sheep or goats, eat both weeds and desirable species. Both have been shown to selectively graze leafy spurge, reducing seed production. Goats are likely to browse more heavily on shrubs that may provide important wildlife food and habitat. The level of management will determine the impact of grazing animals on non-target species.

Impacts of insects and microbial pathogens on non-target vegetation generally would be slight (USDI, BLM 1989). There is only one report of an insect introduced into Montana for weed control that has infested a rare plant. The seed weevil (*Rhinocyllus conicus*), introduced for control of musk thistle, has been reported to infest a rare native thistle. The impact of the weevil on this rare plant is currently being monitored (Achuff and Schassberger 1991). Screening trials now include closely related native plants and other ecologically important species. This greatly decreases the potential for impacts on native vegetation (Story 1991).

Prescribed burning, biological control with livestock, application of chemical herbicides, and mechanical weed control methods all have the potential to adversely affect plants considered to be endangered, threatened, or sensitive by the Montana Natural Heritage Program. Treatment with any of the above methods could adversely affect these special-status plants. However, competition from noxious weeds for light, nutrients and moisture also threaten these plants.

Soils

Herbicide Treatments

The EPA pesticide registration process and residue studies evaluate impacts to soil from residual herbicide levels. Potential impacts include loading (accumulation of herbicide residues), alteration of soil flora and fauna, and increased salt content. Although herbicide loading may have significant consequences, little is known about its effects in Montana soils (Clark 1990). However, loading is most likely to occur with persistent herbicides (Sparks 1989). Effects of herbicides on soil organisms are expected to be of short duration and not significant (Audus 1976). Increased salt content is expected to occur only in cases of extreme mismanagement concerning application amounts and scheduling. Table 6-1 shows properties of five commonly used herbicides and their interaction with soils, water, and air.

Chemical, physical, and microbial processes in the soil influence the breakdown and movement of herbicides. In addition, environmental factors, herbicide properties, and application rates will also affect the persistence and mobility of herbicides in the soil. In general, herbicide breakdown is more rapid in warm, moist soils than in cold, dry soils. Soil conditions, such as high organic matter content, will increase herbicide adsorption and favor microbial populations. Appendix H contains a more technical explanation of soil processes that follow the application of herbicides.

A study conducted in Montana measured the persistence and movement of picloram in soil and its potential for contamination of surface and ground water resources. Results of the study showed that Tordon 22K (picloram) applied at 1 pint per acre moved to a maximum depth of 20 inches in 90 days. Thirteen percent of the herbicide remained in the soil 365 days following treatment. An application of Tordon 22K at 2 quarts per acre moved 40 inches through the soil. Concentrations of picloram were not found in either surface or ground water resources at either site (Watson *et al.* 1989). Persistence and movement of picloram in the soil will vary with specific soil characteristics and climatic conditions.



Whitetop

Other Treatment Methods

Cultural weed control methods include seeding, fertilization, irrigation, promoting brush and tree canopy cover, and prescribed burning (MDA 1986). Of these practices, prescribed burning and seeding are likely to have more than short-term impacts on soil. Prescribed burning, because it consumes living and dead vegetation as well as soil organic matter, alters the chemical, physical, and microbiological properties of soil. Low-intensity fires increase soluble nitrogen, phosphorus, potassium, sulfur, magnesium, sodium, and calcium; as a result, the cation exchange capacity and pH are increased. Microorganism populations and activity rates decline after a burn, but can eventually recover to levels higher than those existing prior to treatment. Postfire soil temperatures increase for a short time after a burn because of reduced vegetative cover and increased soil droughtiness (USDI, BLM 1989). Planting and seeding practices include the establishment of desirable plant species to compete with noxious weeds. These methods are intended to prevent noxious weeds from becoming established or slow their invasion.

TABLE 6-1

FIVE HERBICIDES IN PROMINENT USE IN MONTANA AND PROPERTIES RELATING TO THEIR INTERACTION WITH SOILS, WATER AND AIR

Name ⁽⁶⁾	Chemical	Chlorpyrifos	Dicamba	2,4-D (Various Names)	Picloram	Glyphosate
	Commercial	Stinger, Curtail	Barvel		Tordon	Roundup, Rodeo
Organic Compound Classification ^(1,5)		Picloric Acid	Benzoic Acid	Phenoxy(Phenoxyalkanoic)	Picloric Acid	Miscellaneous and Aliphatic
Molecular Weight ⁽⁹⁾		192	221.04	221.0	241.5	169.1
Persistence* (2, 3, 8, 9)		1-3 months	<3-12 months	1-4 weeks	1 month-> 4 years	Short**
Mobility ^(8, 9)		High	High Affected by capillary movement and surface evaporation	Relatively High	High	Relatively Low
Adsorption to Soil Colloids ^(8, 9)		Low	Low	Moderate	Low	High
Leaching Potential ^(4, 7, 8)		High	High Readily leached; runoff possible w/heavy rainfall after spraying	Low to Medium Formulation dependent; salts more leachable than esters; runoff potential greater for esters	High Seldom leaches below 20-30 cm for most soil types except sandy soils; runoff likely if heavy rainfall within 1 to 2 mos after application	Low Minimal
Water Solubility (25°) ⁽⁹⁾		.1 g/100 ml	0.65 g/100 ml	0.09 g/100 ml	0.043 g/100 ml	1.57 g/100 ml
Surface Runoff Loss Potential ⁽⁷⁾		Low	Low	Low to Medium	Low	High
Microbial Degradation ^(4, 9)		Major Mechanism	Major Mechanism	Rapidly Degraded	Slowly Degraded	Slowly Degraded
Volatile ^(4, 9)		No	Yes	Yes (formulated products)	No	Low
Photo Degradation ^(4, 9)		None	Degrades Slowly	Minor	Yes	Minor
Other Comments ^(2, 9)				Sesone (phenoxy herbicide) reacts with water in soil to form 2,4-D		

* Factors affecting persistence are volatility, photodecomposition, adsorption, leaching, runoff, plant intake, microbial decomposition and chemical decomposition.
 ** No herbicidal activity in soil, although residues can be detected.

1. Ashton and Crafts 1981
 2. CAST 1985
 3. DOE 1983

4. EPA 1981
 5. Grover 1988
 6. MDA 1986

7. Meister 1991
 8. USDI 1985
 9. Colby et al.

Mechanical and manual methods for controlling weeds include mowing, plowing, disking, grubbing, and hand pulling. Mechanical methods that directly disturb soil by removing vegetation and exposing the soil surface increase potential for soil loss by wind and water erosion. If a soil crust develops while the soil is exposed, infiltration rates will decrease and runoff will increase. Soil compaction occurs on loosened soil when a disturbed area is reseeded, particularly if the soil is wet. Mowing and limited hand pulling would have minimal effects on the soil. Mowing would add litter to the soil surface.

Biological methods used to control weeds include grazing animals, insects, and pathogens. Overgrazing may reduce plant cover and expose soil to wind and water erosion. Compaction may also occur if overgrazing is allowed on wet soils. Potential impacts to the soil from insects and pathogens would be minimal (USDI, BLM 1989). Under proper management, grazing animals may increase the amount of litter on the soil surface.

Water Resources

An interrelationship exists between ground water and surface water resources in the natural system. This is most apparent in drainage basins with well developed alluvial aquifer systems. A typical drainage basin can have areas where the stream channel is gaining water from ground water (influent) or losing water to the ground water system (effluent). As such, changes in ground water quality can result in changes to surface water quality as a function of the interrelationship between the two water resources.

Continuing the current administration of the NWTF program has the potential to impact surface and ground water resources. This potential results primarily from weed control methods involving herbicides, tilling, mowing, and burning. Other methods used to control and eradicate noxious weeds (biological and cultural controls, prevention, education) pose little threat to surface water and ground water quality. The following sections describe the potential impacts of the program on surface water and ground water.

Surface Water

Herbicide Treatments

Herbicides may enter surface water either through non-point sources such as spray drift, erosion of soil containing herbicides, ground water discharge, irrigation return flows, and surface runoff. Point source problems such as improper cleaning, mixing, loading activities, and accidental spills of herbicides can also enter surface water.

Herbicides may reach the surface of watercourses during storms and remain in detectable concentrations for short periods. Information linking the use of herbicides to long-term impacts on surface water resources in Montana has not been documented.

The riparian zones associated with many surface watercourses may present severe limitations for the safe use of herbicides. These areas frequently have water at or near the ground surface, thereby increasing the potential impacts of herbicides.

The potential for a herbicide to reach surface water through runoff is a function of herbicide characteristics, application rate, soil type, slope, vegetation, the length of time between application and rainfall, and the presence or absence of a non-treated buffer between the application site and the surface water. Both picloram and 2,4-D have been reported to enter surface water through runoff. However, a study conducted by the EPA to measure runoff of picloram concluded that, under field conditions, picloram does not present a serious threat to water quality a short distance downstream from the application site (Evans and Duseja 1974). Runoff potential of clopyralid and dicamba should be similar to that of picloram. The relatively strong adsorption of glyphosate to soil particles suggests it is unlikely to reach surface water through leaching, however, it may be detected in water if soil particles are moved into a watercourse during rainfall.

Herbicide drift from spray applications may directly enter surface water. The amount of spray drift depends on the herbicide formulation, size of droplets, amount of wind, and height above

ground from which the spray is released. The use of application methods that allow better control (i.e., backpack or vehicle) and spraying during periods of little or no wind greatly reduces this threat.



Other Treatment Methods

Other weed control methods may also impact surface water resources. Mechanical treatments such as tilling, burning, and mowing can result in increased sediment loading in water courses. These methods disturb vegetative cover and consequently can increase soil movement. Riparian habitats may be affected by introducing or encouraging intensive grazing in weed-infested areas.

The use of an integrated management approach for noxious weed control may involve the use of herbicides in selected areas. Under the inte-

grated approach, areas identified as having high potential for surface water contamination would receive alternative methods of weed control, such as biological control or hand pulling. In some cases, herbicide application in sensitive areas might be possible by utilizing less persistent or mobile herbicides, lower application rates, or more selective application methods.

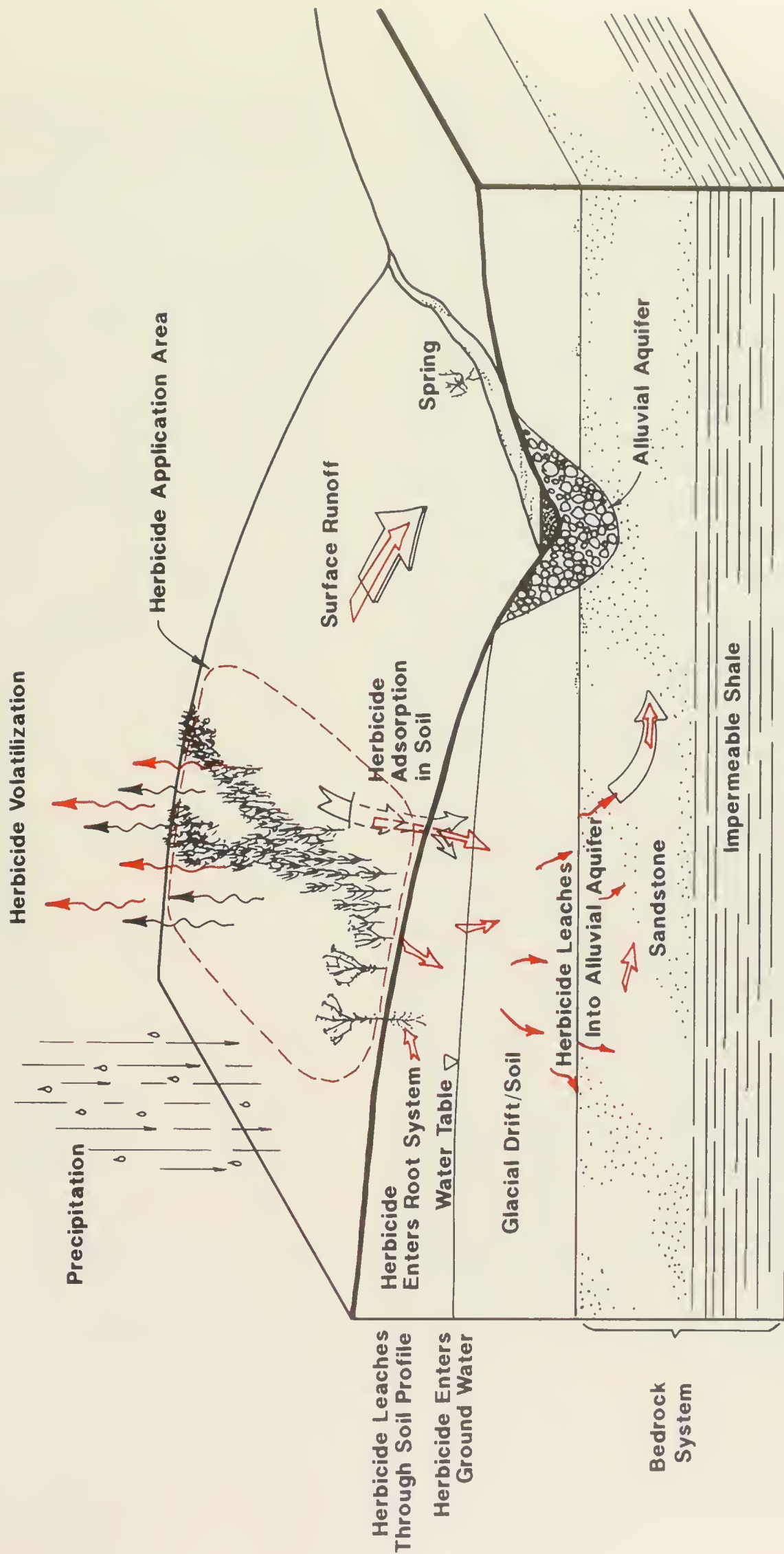
Ground Water

Ground water is an important source of domestic and agricultural water in Montana and must be protected from the introduction of herbicides. The ability of a herbicide to reach the ground water depends on soil properties, climatic conditions, depth to ground water, agricultural practices (e.g., irrigation, pumping wells), application and its chemical properties. Figure 6-1 presents an example of the source/pathway/receptor route through which herbicides may enter ground water. Once a herbicide reaches the ground water system it is extremely difficult to remove. The rate at which a herbicide found in ground water is diluted, dispersed, or degraded depends on aquifer characteristics and herbicide properties.

Areas with relatively shallow water tables, unconsolidated sand and gravel materials, and rapid to moderately rapid permeable soils containing little or no organic matter are highly susceptible to ground water degradation by herbicides. In contrast, areas with greater depths to ground water and well developed, deep, organic soils are less prone to ground water impacts resulting from herbicide use.

Herbicide users must follow label directions to prevent impacts to the environment. Label directions and restrictions are based on EPA registration standards. Appendix F contains herbicide labels of several products commonly used in Montana. Material Safety Data Sheets for these herbicides are contained in Appendix G.

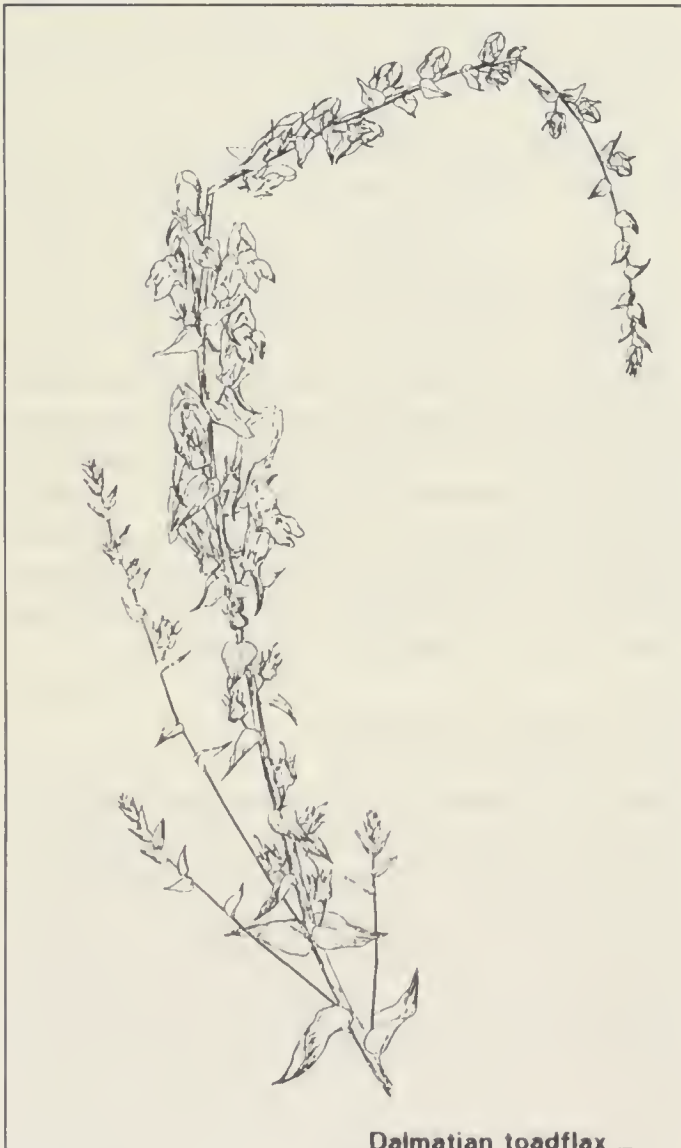
Picloram, 2,4-D, clopyralid, and dicamba are considered mobile in the soil environment. Product labels restrict applications of both picloram and clopyralid on sites with shallow water tables and soils with rapid to very rapid permeability.



Herbicide Movement in the Environment
 NWTF-Programmatic EIS
 FIGURE 6-1

Although the use of 2,4-D and dicamba are not restricted by label, they are also subject to leaching in soil. Glyphosate is more readily adsorbed by soil particles, and hence less mobile in the soil environment.

The method, frequency, and rate of herbicide application also affects the potential of the herbicide to impact ground water resources. Herbicides applied directly to the soil are generally incorporated and may be subject to less photodegradation, thus increasing amounts available for leaching. Application rate influences the potential of a herbicide to reach the ground water; generally the higher the application rate, the higher the concentration in the soil, and the slower the herbicide will degrade.



Herbicide Impacts on ground water through point discharges (e.g., uncontrolled releases at mixing, loading, and storage facilities or accidental spills) are greater than those from non-point discharges because chemicals are often introduced at high concentrations. Contamination of domestic water supplies from point source discharges has been documented (DeLuca *et al.* 1989).

The 1989 Legislature recognized potential impacts from herbicide applications and consequently passed the Montana Agricultural Chemical Ground Water Protection Act (MACGPA). MACGPA is jointly administered by the MDA and the Montana Department of Health and Environmental Sciences (MDHES). The MDA has recently promulgated rules and the MDHES anticipates that its portion of the rules will be promulgated and adopted during 1991-1992.

The passage of MACGPA may have a bearing on administration of NWTF cooperative group programs that involve the use of herbicides. The lack of a complete set of rules for the act's implementation makes it difficult to predict how administration of these projects may be affected.

Under MACGPA, MDA has the authority to designate areas as sensitive to potential chemical impacts and to limit or discontinue the use of certain chemicals in these areas. The designation of an area as sensitive to ground water contamination may be based on either identification of present pesticide problems or potential for future problems. It is likely that the potential impacts of herbicide application on ground water resources will be reduced under MACGPA.

In addition, the MDA is charged with development of Best Management Practices (BMPs) to provide agricultural chemical users and the general public with guidelines for the proper use of herbicides. BMPs would also specify guidelines for the safe mixing, storing, and disposal of herbicides purchased with NWTF monies, thereby reducing the likelihood and severity of both point and non-point source releases.

Wildlife

Herbicide Treatments

Impacts to wildlife could result from removal or reduction of vegetation that provides food and cover. Big game species which eat broadleaf plants and shrubs (e.g., pronghorn, mule deer, and white-tailed deer) as a large proportion of their diets could experience a reduction in preferred foods on lands where these species are eliminated or their density reduced by herbicide applications. Elk, which rely primarily on grasses, would benefit from selective weed control measures because grasses are likely to increase after herbicide treatment. Wildlife habitat can also be improved by selective weed control methods by eliminating a weed monoculture and replacing it with a more diverse plant community. Honey bees and other pollinating insects may be harmed by weed control efforts which remove both noxious weed infestations and non-target flowering plants. Honey bees gather nectar from spotted knapweed and other plants such as sweet clover to make honey (Kissinger 1991).

Wildlife could be affected through direct contact with chemical herbicides (e.g., spraying of nesting birds) or through ingestion of treated plants or contaminated drinking water (USDA, FS 1987). The risks to fish and wildlife from exposure to herbicides 2,4-D and glyphosate are discussed in detail in the Bureau of Land Management Final Environmental Impact Statement, Northwest Area Noxious Weed Control Program (1985). Potential impacts to wildlife from exposure to the herbicides clopyralid, dicamba, and picloram would be less than those for 2,4-D and glyphosate (USDI, BIA 1988). In general, herbicides pose little risk to wildlife because:

- ◆ Many species move away from spraying operations.
- ◆ Some herbicides degrade rapidly and most do not accumulate or persist in food chains.
- ◆ Small areas of habitat (relative to total habitat available) are treated.

- ◆ Herbicides applied at recommended rates are non-lethal to most species.

The potential for causing impacts to threatened and endangered species through weed control activities will be reduced as a result of the EPA's Endangered Species Program. This program will be implemented in 1992, with the intent to prevent harm to threatened and endangered species from the use of pesticides. Pesticide labels will contain restrictions on use for various counties and a supplemental label bulletin will be available that will contain:

- ◆ A list of pesticide active ingredients to which threatened and endangered species restrictions apply.
- ◆ An explanation of use restrictions that apply to each active ingredient.
- ◆ A list of threatened and endangered species to which restrictions apply.
- ◆ Maps or legal descriptions that show where, within counties, the restrictions apply.

Potential impacts to fish could result if herbicides enter streams through either accidental or direct application, drift, or transport of chemical residues from upland areas. Under routine circumstances, herbicide application could have slight impacts on fisheries. Introduction of a moderately toxic herbicide into surface waters in relatively large amounts could cause localized fish kills.

Other Treatment Methods

Mechanical methods of controlling noxious weeds during the nesting season have the potential to destroy nests and young of ground-nesting birds, as well as small mammals not able to avoid machinery. The use of cultivation would destroy habitat for both large and small game and non-game species until establishment of seeded species. Impacts to wildlife from these methods would be localized and would cause minor reductions in populations.

Prescribed burning has the potential to kill small mammals, reptiles, and birds unable to flee. Burning also would result in a temporary loss of cover and some shrub species used for forage. Burning in some cases could result in more dense weed regrowth than existed before treatment (USDA, FS 1986).

Biological control involving sheep or goats probably would displace some wildlife during the treatment period and could reduce forage for the treatment year. Other biological methods of weed control such as insects or microorganisms would have minimal effects on wildlife.

Potential impacts to threatened and endangered species could result if weed control activities are conducted near nesting sites of bald eagles and peregrine falcons. These species are sensitive to disturbance during nesting and brood rearing and may be forced from their nests by human activities. Such displacement could result in death of embryos in eggs, thermal stress to nestlings, and increased predation on nestlings.

Mechanical weed control, biological control with livestock, and prescribed burning could indirectly affect fish and other aquatic organisms through increased sedimentation. Removal of vegetation would result in potential short-term increases in surface runoff and sediment transport to streams. Generally, impacts would be minor because targeted areas would comprise only a small percentage of most watersheds.

Land Use

Continuation of the NWTF program as it is currently administered would result in limited impacts to land use. Increased grass production resulting from control of noxious weeds could improve wildlife and livestock distribution and increase numbers of animals that could be supported by an area. Weed prevention practices resulting in road closures could affect recreational use of some areas.

Air Quality

Two types of weed control methods used in NWTF projects have the potential to affect air

quality: burning and herbicide treatment. The impact from burning would be minimal since it is not an effective method of controlling noxious weeds found in Montana. Limited burning may occur in areas to remove standing litter of noxious weeds prior to initiating other control measures. Because it is normally done during periods of atmospheric instability, weed burning is not likely to result in particulate emissions that exceed state ambient air quality standards.

Herbicide treatments from aerial and ground vehicles have the potential to affect air quality when chemical particles are suspended in the atmosphere. The impact on air quality depends on the type and concentration of these particles as well as the length of time they are suspended.

Spray drift, the movement of airborne spray particles from the target area, poses the greatest air quality concern. Extent of drift depends primarily on the size of the chemical droplets and wind speed. Liquid spray droplets most prone to drift are ordinarily smaller than 100 microns in diameter (Klingman and Ashton 1982). Most spray equipment used in Montana is calibrated to produce spray droplets twice that size (200 microns). When herbicides are applied aerially in a 5-mph wind, the concentration of spray that drifts 100 feet downwind is less than 1% of that found on the target area (USDI, BLM 1985).

Research has shown that under certain meteorological conditions, highly volatile formulations of 2,4-D have the potential to drift for long distances (Robinson and Fox 1978). The effects of spray drift from herbicides containing picloram are less certain. The U.S. EPA (1985) acknowledged it could not determine if non-targeted plants are being damaged by picloram's drift and that damage might result from other factors, including applicator error, misuse, leaching, runoff, or persistence. Norris (1983) observed few effects of offsite drift of herbicides containing picloram on non-target vegetation, and concluded that spray drift was minimal.

Chemicals can also move through the air in volatilized (gaseous) form. Volatilization is reported to be negligible with glyphosate (WSSA 1983) and picloram (NRCC 1974). With 2,4-D,

volatilization depends on the formulation; acids and amines are less volatile than esters, which vary from high to low. The oil-soluble amines are considered the least volatile. Dicamba may volatilize from soil surfaces, but further study is needed to determine the extent. Volatilization is not considered a problem with picloram or clopyralid due to low vapor pressure.

Cultural Resources

Some weed control methods, particularly mechanical, could affect cultural resources. Use of hard-edged tools or mechanical methods (tilling, roller chopping, or blading) could damage or destroy subsurface artifacts. Unearthing of cultural materials also may increase the possibility of artifact theft or vandalism (USDI, BLM 1989).

Prescribed burning may damage or destroy cultural resources, depending on depth to which artifacts are buried, temperatures to which they are exposed, and types of material from which they are made. Construction of firelines around prescribed fire boundaries also could harm subsurface cultural resources (USDI, BLM 1989).

Socioeconomic

Economic Impacts

The economic impacts related to continuation of the NWTF program are primarily beneficial. Direct economic benefits realized through local purchases of chemicals and application of herbicides amount to approximately \$0.7 million per year from the NWTF program. Indirect economic benefits from the NWTF program are realized from farmers' and ranchers' perceptions that the state is actively participating in the fight against noxious weeds. Should the state government show little interest in helping control noxious weed problems, then less interest may be shown at the local level and fewer local expenditures would be made for weed control.

Continuation of the NWTF program would result in costs and benefits to state and local economies from weed control. The increase in noxious weed infestations, estimated at 5 to 24% annually, would remain approximately the same (USDA, FS

1986). Economic losses to the agriculture industry due to noxious weeds would persist. Expenditures for herbicides and weed control research would also continue at present rates.

Social Impacts

People confronted with loss of land productivity (usually farmers and ranchers) due to noxious weeds would likely consider alternative 1 to be a positive approach to dealing with weed problems. Those opposed to dispersal of chemicals into the environment would likely view it as potentially affecting human health and reducing environmental quality. This could increase their levels of concern if alternative 1 were selected.

Individuals may be concerned about the state's liability should the NWTF program be shown to affect the environment and human health. Lawsuits against the state for damages associated with herbicide use could be extremely costly, requiring taxpayers to "foot the bill." The possibility of increased taxes to cover liability for a program perceived to benefit a small segment of society may be viewed negatively by some Montana residents.

Recreation and Visual Quality

Continuation of the NWTF program as it is currently administered would have few impacts on recreational resources. No long-term adverse impacts are anticipated from biological, chemical, or mechanical weed management. Short-term impacts could result from the use of chemical weed control or prevention measures. Road or facility closures within project areas in conjunction with weed control efforts would reduce or eliminate recreational uses in specific areas for limited periods. This could shift recreational pressure to other areas, causing a decline in recreational quality due to crowding or overuse. Enjoyment of recreational sites may be diminished if the management program causes a reduction in the vigor or amount of non-target vegetation.

Effects on the visual resource depend on weed control methods employed. Chemical control could change the vegetative composition of treated areas, causing a contrast between treated

and untreated areas that may be visually unattractive. Chemical treatment could also change the pattern of colors in treated areas, especially during the flowering season. Impacts would most likely be short-lived, and contrasts would disappear as residual vegetation blended in with the surrounding landscape.

Mechanical and cultural control methods such as mowing, tilling, and burning, which result in disturbing the land and exposing bare soil, could also affect the visual resource. These methods are not widely used, however, and would probably be little noticed, especially in agricultural areas. Burning can affect visibility while it is in progress, and creates blackened areas that may not be pleasing to the eye. Because burned areas revegetate quickly, only short-term visual impacts are expected.

Biological weed control methods, prevention and education efforts would have little effect on visual quality. Examples of these activities that could affect the visual resource include utilization of grazing animals, altering fencing patterns, and installing informational signs. These management techniques are applied only to limited areas and would tend to blend with existing landscapes.

Human Health

Herbicide Treatments

Human health risks associated with herbicides used for noxious weed control have been documented in "Analysis of Human Health Risks of USDA Forest Service Use of Herbicides to Control Noxious Weeds in the Northern Region" (Monnig 1986). Conclusions in this report indicate that even when consideration is given to mixing errors and a variety of accident scenarios (e.g. spills, leaks, etc.), the "no observable effect levels" (NOEL) for human health are not exceeded. Health impacts to the general public are related either to direct contact with herbicides through spray drift, spills, and sprayed vegetation or to indirect contact through consumption of contaminated water, vegetables, fish, and grazing animals. The most serious human health risk, however, is through worker exposure. Although the NOEL's for workers, supervisors, and people

directly involved in the mixing, application, and handling of herbicides are not normally exceeded, the "acceptable daily intake" (ADI) may be exceeded in some cases.



Canada thistle

Other Treatment Methods

Mechanical, manual, and cultural weed treatment methods, such as burning, mowing, tilling, and hand pulling, subject workers to smoke, burning materials, heavy machinery, skin irritants, and general hazards associated with field work. Operators of mowing machines, tillers, or other heavy machinery are prone to injury through accidents or contact with flying debris or brush. Hand pulling of weeds can expose workers to hazards such as poisonous snakes or noxious plants that cause blisters, inflammation, or dermatitis.

The Integrated management approach includes aspects of some or all of the standard weed control methods. As a consequence, the impacts to human health are equal to or somewhat less than those described for both manual/mechanical and chemical methods. An integrated management approach which relies primarily on the use of herbicides would have greater potential human health impacts than methods employing predominantly biological controls. The EPA re-registration process will continue to evaluate acute and chronic toxicity affects. Label directions and restrictions will be modified to reflect the results of new data.

ALTERNATIVE 2 -- GENERAL MODIFICATIONS TO THE EXISTING NWTF PROGRAM

DIRECT IMPACTS

As with alternative 1, the direct impacts associated with alternative 2 are primarily economic impacts and liability issues. Because NWTF administrative costs would increase from the current 6.5% to an estimated 11% of the program budget, less money would be available for weed control grants. The projected increase in administrative costs is a reflection of the need to either add technical staff, establish liaisons with other state agencies that have the necessary expertise, or contract with other parties for professional services. Assuming that administrative costs at the 11% level would total about \$140,000 per year, grants would be reduced to \$1.16 million (1990 funding levels). This reduction in grant monies would result in a decrease in the number of grants funded.

The addition of an employee, agency liaison, or contracted services would allow the MDA to review each application for compliance with MEPA, reduce potential state liability, and improve project evaluation.

Potential liability for the State of Montana associated with alternative 2 would be reduced through the expanded environmental assessment (EA) afforded under this alternative. The MDA

would be able to provide more scrutiny of individual grant applications, identify data gaps for sensitive resources, complete field evaluations for each project, improve documentation and performance appraisal of the program, and aid grant applicants in the preparation of grant proposals.

Better documentation of the program would help protect the state from responsibility under other laws (i.e., Clean Water Act, Clean Air Act, Comprehensive Environmental Cost Recovery Act (CECRA), Montana Pesticides Act, Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), Montana Agricultural Chemical Ground Water Protection Act, and the Safe Drinking Water Act).

INDIRECT IMPACTS

Vegetation

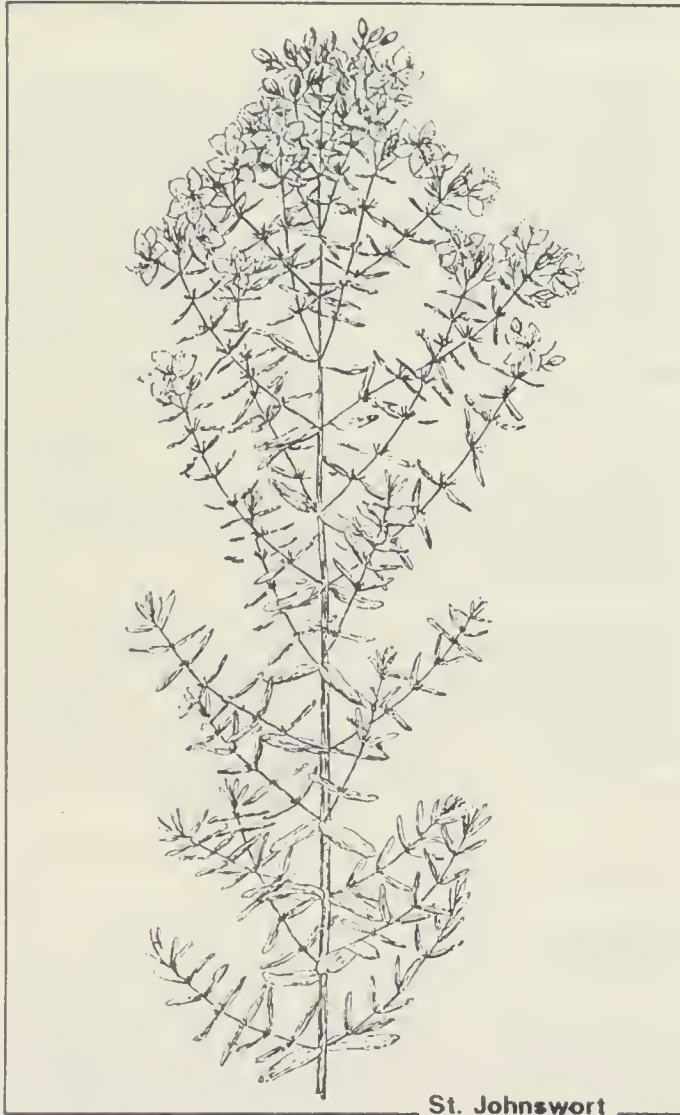
Modifying the NWTF program to integrate additional environmental information into decision-making or grant approval would potentially reduce impacts to threatened, endangered, or sensitive plants. The MDA could specify that populations of special-status plants be identified and avoided. Monitoring to ensure that grant recipients comply with such conditions would increase the potential to mitigate impacts to special-status plants; however, because these plants have no legal status and the state has no policy to manage them, conditioning grant approval on their avoidance may be difficult.

Soils

Requiring grant applicants to provide information on site characteristics, including topography, wetlands, proximity to streams, water table depth, and soil depth and texture, could help mitigate potential impacts. Through the EA process, the MDA could assist grant applicants in choosing weed control methods compatible with site-specific conditions. Mitigation of impacts could consist of restricting some weed control methods where surface and ground water may be degraded, where soil loss potentials are severe, or where herbicide persistence or soil compaction could occur.

Water Resources

Under alternative 2, the MDA would assure compliance with MEPA through environmental review of project proposals. This review would identify areas sensitive to ground water and surface water contamination and would have the authority to condition grant approval on protection of these resources. The environmental review, along with continued emphasis on integrated weed management, would enhance protection of ground water and surface water resources.



St. Johnswort

Wildlife

Requiring grant applicants to obtain information on nesting and habitat use in the project area by threatened and endangered species (bald eagle, peregrine falcon, piping plover, and least tern) and other non-threatened species would allow implementation of measures to mitigate effects on

these species. Mitigation would consist of restricting weed control activities near nesting sites during the nesting and brood-rearing period (April through August). Funding for grant applicants could be made conditional on mitigating impacts to Important wildlife and their habitat.

Land Use

Administrative modifications to the NWTF grants program would have limited impacts on land use.

Air Quality

Impacts to air quality resulting from implementation of alternative 2 would remain essentially the same or slightly lower than the impacts described for alternative 1.

Cultural Resources

Modification of the NWTF program to require additional environmental information, more administrative control, and better monitoring could have positive impacts on cultural resources. Prior to authorizing a noxious weed control project, cultural resources could be identified and avoided.

Socioeconomic

Economic Impacts

The costs and benefits to the economy under this alternative would be similar to those for alternative 1. Increased administrative costs of the NWTF program would result in somewhat less money spent for research, education, and direct control of noxious weeds.

Social Impacts

Many persons may oppose modifying the NWTF program to require additional environmental information or conditioning approval of grants on monitoring certain species or site conditions. An opinion survey of grant recipients and others associated with the program indicated that most feel the current paperwork and administrative control of the program is adequate. It is generally perceived that grant monies are more effectively spent on weed control measures rather than on more extensive environmental review or administrative control.

Some members of the public may consider additional administrative control, environmental review, and environmental monitoring of grant projects to be positive measures to help ensure MEPA compliance and prevent potential impacts on sensitive components of the environment. These people would perceive additional environmental evaluation and administrative control as a small price to pay for enhanced accountability and regulation of projects with potential to impact human health and the environment.

Recreation and Visual Quality

Since the management techniques employed under this alternative would remain essentially the same as those used in alternative 1, impacts on recreation would be negligible.

Implementing alternative 2 would have little effect on visual resources. Since the management techniques employed under the NWTF program would remain basically the same, the impacts associated with this alternative would be similar to those described in alternative 1.

Human Health

Enhanced environmental review of grant proposals under alternative 2 will result in an increase in environmental and project information for decision making purposes, improved awareness of proper weed management, and minimization of human health risks associated with future projects.

ALTERNATIVE 3 -- DISCONTINUATION OF THE NWTF PROGRAM

DIRECT IMPACTS

The NWTF represents a unique approach to noxious weed control in Montana. The focus of the program is to fund local cooperative weed control projects and to promote noxious weed research and education. The NWTF program recognizes that weed infestation problems are not defined by political boundaries and provides cost-share funds to groups that manage noxious weeds irrespective of those boundaries.

Termination of the NWTF would result in the money being divided among all counties, according to rules to be adopted by the MDA. Responsibility for public noxious weed control would remain at the county level, reducing the effectiveness of weed control due to problems associated with political boundaries and lack of coordinated efforts among private landowners. It would also greatly impact the biological control program in Montana, by slowing the screening, rearing, and redistribution of insects and pathogens. This would delay the development of long-term, cost-effective weed control. Research and educational programs on noxious weeds would also be reduced.

Direct impacts associated with the discontinuation of the NWTF program would include the economic impact of less money being available for control of noxious weeds. The net effect would be a reduction in the overall control of noxious weeds and subsequent reduction in the value of weed-infested lands. Other impacts would include reduced agricultural income from weed-infested lands, reduced wildlife habitat, and the environmental impacts discussed in Chapter 2. The rapid spread of weeds would cause economic and environmental impacts to increase as more areas became infested.

With this alternative, potential future state liability for remediation of environmental problems associated with noxious weed control would be eliminated. As a consequence, the impacts to state government would be negligible.

INDIRECT IMPACTS

Vegetation

Without the NWTF program, it is likely that fewer weed-infested areas would be treated. Reduced control would lead to expansion of areas infested with noxious weeds and increased losses of desirable plants. Noxious weeds would eliminate or reduce many desirable plant species through competition for growing space, moisture, and nutrients or through secretion of chemicals which inhibit the growth of many native plants.

Soils

Abandoning the NWTF program would eliminate soil impacts caused by weed management projects funded by the NWTF. Although impacts associated with the NWTF program would cease, soil impacts would continue due to weed management programs conducted by county, state, and federal agencies and the private sector. Accelerated soil loss, which occurs when tap-rooted weeds replace native grasses, would increase as weeds continued to spread.

Water Resources

Abandoning the NWTF program would eliminate any state liability associated with environmental degradation of water resources that could result from the misapplication of chemical herbicides. Since the NWTF accounts for approximately 5% of the chemical weed control conducted in the state, the potential for water resource impacts still exists.

Wildlife

Abandoning the NWTF program would reduce the potential to destroy non-target plants, but it would also allow noxious weeds to increase, thus reducing plant diversity and habitat value for elk, deer, and other wildlife. Failure to control or limit the spread of noxious weeds such as knapweed and leafy spurge could reduce the long-term productivity of palatable plants.

Land Use

If the NWTF program were abandoned, land use of infested areas could change. Although livestock grazing would remain the dominant use of rangeland, the type of livestock grazed may change from cattle to sheep. As productivity of the land further declined, some areas could revert to non-use.

Air Quality

Discontinuing the NWTF program would have an insignificant impact on air quality.

Cultural Resources

Discontinuing the NWTF program would have an insignificant impact on cultural resources.

Socioeconomic

Economic Impacts

Because weed infestation rates would be somewhat higher if the NWTF were abandoned, costs to both statewide and local economies would increase at a faster rate than under alternative 1 or 2. Land values would also decrease at an accelerated rate and lost revenues to both local government and business would increase at a faster rate than under alternative 1 or 2. Under alternative 3, the benefits from NWTF expenditures for local purchases of chemicals and income from application of herbicides would not be realized. Assuming that weed control on private, state, and federal lands would decline because of lack of coordinated efforts, the cost to ranchers would increase through decreased livestock production, decreased land values, and increased weed management costs.

Social Impacts

Persons relying on the NWTF program to assist in noxious weed research and control would lose a source of funding with this alternative, which could cause them concern. Some people would reduce their weed management efforts as a result or perhaps use other funds to carry out weed management and research programs.

Abandoning the NWTF program would be favored by individuals who oppose the use of herbicides or consider their use to be ineffective in controlling the proliferation of noxious weeds. Some people may not be aware that the NWTF program sponsors a variety of weed management techniques.

Recreation and Visual Quality

Discontinuing the NWTF program would reduce the short-term impacts on recreation described in alternative 1. Since these impacts were expected to be minimal, few differences in recreational experience would be realized by abandoning the program.

Abandoning the NWTF program could have some effects on the visual resource. For weed species that are considered attractive, the impact would be positive; for species considered unattractive, the impact on visual quality would be negative.

Since most impacts of weed control on the visual resource are short-term, effects of discontinuing the program would be minimal.

Human Health

Since the NWTF accounts for only 5% of the chemical control of noxious weeds in Montana, abandoning the program would not greatly affect the potential human health hazards that result from chemical weed control.

CUMULATIVE IMPACTS

The NWTF program represents approximately 5% of the chemical noxious weed control effort in Montana. This percentage is based on total herbicide sales in the state and the estimated portion of these sales that apply to noxious weed and non-cropland weed control. The remaining 95% of herbicides purchased for non-cropland and noxious weed control is under other state, federal, local, and private programs.

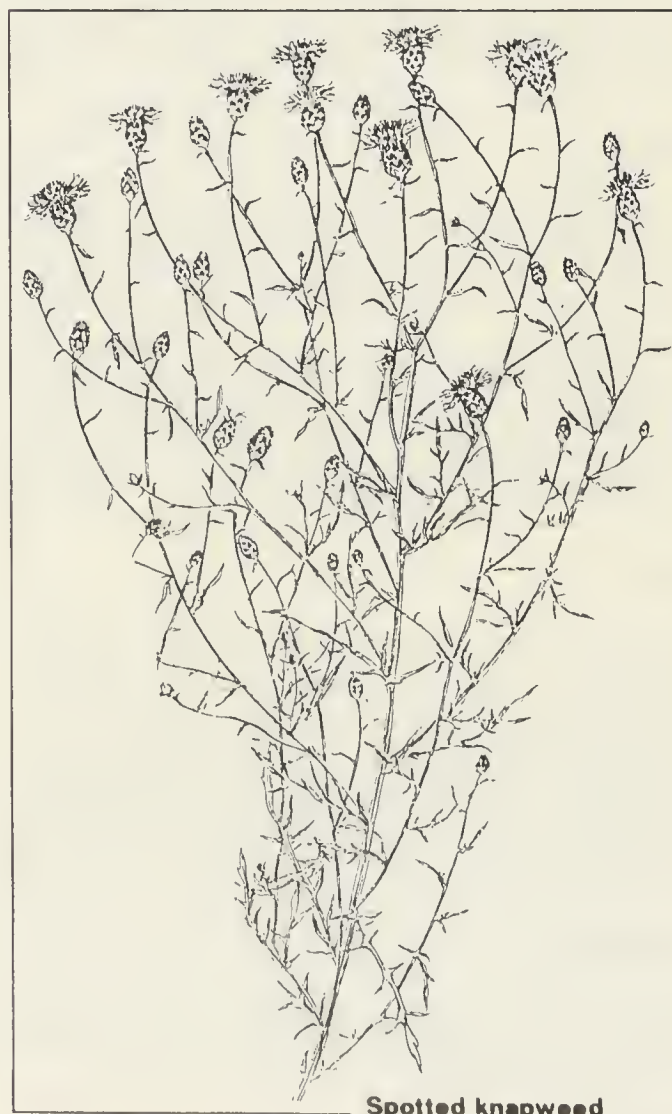
Cumulative adverse impacts resulting from herbicides and other weed management methods applied through NWTF cooperative weed management projects are negligible. Positive impacts include an increased public awareness of noxious weeds, development of cooperative weed management projects among state, federal, and private organizations, and promotion of integrated methods for managing weeds. The loss of NWTF revenue for cooperative weed management projects involving integrated weed management methods would greatly reduce the number of cooperative projects between private, state, and federal entities.

Since its inception, the NWTF Act has allocated 33% of total revenue toward support of non-chemical weed management programs. These monies have accounted for 50% of the state's biological research effort, in addition to supporting other weed research and education programs. Loss of revenue for biological research, other weed research, and education programs would have a significant cumulative impact on the weed management effort in the state.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Irreversible commitments of resources result when resources are altered to the point that they can be renewed only after 100 years or more. The primary irreversible commitment of resources would be the use of fossil fuels to manufacture and apply herbicides. Alternatives 1 and 2 would require the greatest fuel consumption.

An irretrievable commitment of resources is the loss of opportunity for production or use of renewable resources for a period of time. Changing future management could restore lost opportunity or production. Irretrievable resource commitments would result from localized changes in native vegetation and wildlife habitat from noxious weed control activities.



Spotted knapweed

PREPARERS AND REVIEWERS



Chapter 7

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CHAPTER 7

PREPARERS AND REVIEWERS

NAME	TITLE/FIRM/LOCATION	EDUCATION
David J. Books	Technical Editor Helena, Montana	B.S. Forestry, University of Montana, 1965 M.F. Forest Ecology, Yale University, 1966
Michael Cormier	Environmental Scientist Chen-Northern, Inc. Helena, Montana	B.S. Geology/Environmental Conservation, University of Colorado, 1979 M.S. Land Rehabilitation, Montana State University, 1979
Daphne Digrindakis (EIS Project Manager)	Environmental Scientist Chen-Northern, Inc. Helena, Montana	B.A. Geology, University of Montana, 1979
Richard Dodge	Statistician/Systems Analyst Economic Consultants Northwest Helena, Montana	B.A. Mathematics, University of Montana, 1967 M.S. Statistics, Montana State University, 1973
Joe Elliott	Ecological Consultant Helena, Montana	B.S. Biology, Wisconsin State University (Eau Claire), 1965 Ph.D. Botany, University of Montana, 1969
Thomas Grady	Hydrogeologist/Hydrologist Chen-Northern, Inc. Helena, Montana	B.A. Geology, Carleton College, 1973 M.S. Geology, Montana State University, 1982
Myles Grotbo	Hydrogeologist Chen-Northern, Inc. Helena, Montana	B.S. Earth Science, Montana State University, 1978
Terry Grotbo	Geologist Chen-Northern, Inc. Helena, Montana	B.S. Earth Science, Montana State University, 1977

NAME	TITLE/FIRM/LOCATION	EDUCATION
Michael Houlton	Soils Technlcian Grass-Land Helena, Montana	Undergraduate Studies in Biology, University of Montana, 1974-1975 Undergraduate Studies in Soil Science, Montana State University, 1976-1982
Bonnie L. Johnson	Word Processor Chen-Northern, Inc. Helena, Montana	Undergraduate Studies in English, University of Montana, 1962-1964 Undergraduate Studies in Business, Montana State University, 1964-1966
Celestine A. Lacey	Weed Management Consultant Helena, Montana	B.S. Agronomy, New Mexico State University, 1975 M.S. Agronomy/Weed Science, Montana State University, 1985
Joe Murphy	Environmental Scientist Chen-Northern, Inc. Helena, Montana	B.A. Liberal Arts/Geography, University of Montana, 1971
Duane Noel	Soil Scientlst Grass-Land Helena, Montana	B.S. Biology, Eastern Montana College, 1973 M.S. Soil Physics, Montana State University, 1982
Mitchell Paulson	Graphic Artist Chen-Northern, Inc. Helena, Montana	A.D. Commercial Art Technical Institute, Alexandria, MN, 1974 College of Art and Design University of Illinois, 1975
Linda Priest	Research Associate Economic Consultants Northwest Helena, Montana	B.S. Criminal Justice/Sociology University of Nebraska, 1978

AGENCIES AND OTHER ENTITIES CONTACTED



Chapter 8

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CHAPTER 8

AGENCIES AND OTHER ENTITIES CONTACTED

FEDERAL

Bonneville Power Administration
U.S. Department of Agriculture

- Agricultural Research Service
- Animal and Plant Health Inspection Service
- Forest Service

U.S. Department of the Interior

- Bureau of Indian Affairs
- Bureau of Land Management
- Bureau of Reclamation
- Fish and Wildlife Service
- National Park Service

STATE

Department of Administration
Department of Agriculture
Department of Commerce
Department of Fish, Wildlife, and Parks
Department of Health and Environmental Sciences
Department of Transportation
Department of Justice
Department of Natural Resources and Conservation
Department of State Lands
Environmental Quality Council
Montana Natural Heritage Program
Montana State University

- Agricultural Experiment Stations
- Animal and Range Science Department
- Entomology Research Lab
- Extension Services
- Plant and Soil Sciences Department

University of Montana

- Botany Department

LOCAL

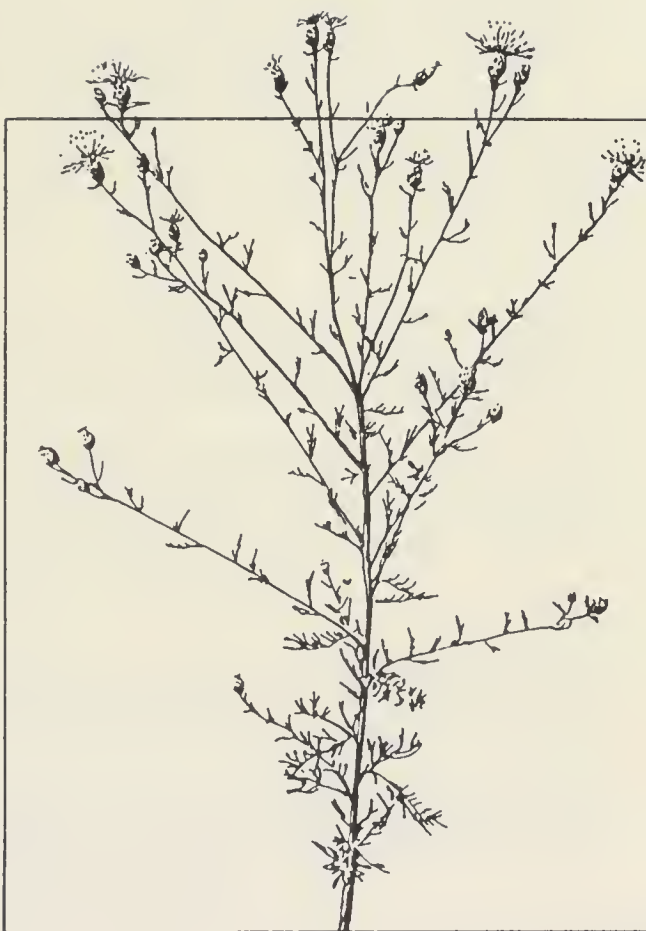
Big Horn County Weed Supervisor
Carbon County Weed Supervisor
Carter County Weed Supervisor
Cascade County Weed Supervisor
Chouteau County Weed Supervisor

Deer Lodge County Weed Supervisor
Fallon County Weed Supervisor
Flathead County Weed Supervisor
Gallatin County Weed Supervisor
Granite County Weed Supervisor
Headwaters Resource Conservation and Development, Range Weed Committee
Hill County Weed Supervisor
Jefferson County Weed Supervisor
Lake County Weed Supervisor
Lewis & Clark County Weed Supervisor
Lincoln County Weed Supervisor
Madison County Weed Supervisor
Mineral County Weed Supervisor
Missoula County Weed Supervisor
Powder River County Weed Supervisor
Richland County Weed Supervisor
Roosevelt County Weed Supervisor
Silver Bow County Cooperative Extension Service
Silver Bow County Weed Supervisor
Stillwater County Weed Supervisor
Stillwater County Cooperative Extension Service
Sweet Grass County Weed Supervisor
Teton County Weed Supervisor
Toole County Weed Supervisor
Treasure County Weed Supervisor
Valley County Weed Supervisor
Wibaux County Weed Supervisor
Yellowstone County Weed Supervisor

OTHERS

Burlington Northern Railroad
Champion International
Montana Power Company
Montana Association of Counties
Montana Dakota Utilities
Montana Weed Control Association
Noxious Weed Trust Fund Advisory Council
Noxious Weed Trust Fund Grant Recipients
Pioneer Weed Control
Plum Creek Lumber Company
The Nature Conservancy

GLOSSARY



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GLOSSARY

ACTIVE INGREDIENT: The pesticide compound or toxicant which produces the desired effect against the target pest. Pesticide formulations are typically 1% to 50% active ingredient (a.i.) the remainder being carriers, solvents, emulsifiers, etc.

ACCEPTABLE DAILY INTAKE (ADI): The daily dosage of a chemical, which, during an entire lifetime, appears to be without appreciable risk on the basis of all the facts known at the time. ADI is expressed in milligrams of the chemical, as it appears in food, per kilogram of body weight (mg/kg/day).

ADSORPTION: Pertaining to soils, it is the adhesion of molecules of a gas, liquid, or dissolved substance to the surface of soil particles.

AMINES: Any of a group of chemical substances derived from ammonia in which one, two, or three hydrogen atoms have been replaced by one, two, or three hydrocarbon groups.

AQUIFER: An underground zone of earth or rock saturated with water whose upper limit is the water table.

BIOLOGICAL CONTROL: The use of natural enemies to control a target plant, retard or prevent growth, and/or prevent seed formation.

CATION EXCHANGE CAPACITY: The sum total of exchangeable cations that a soil can adsorb, expressed in milliequivalents per 100 grams of soil, clay, or organic colloid.

COLLUVIAL: A general term applied to loose and incoherent deposits, usually at the foot of a slope or cliff and brought there chiefly by gravity.

DEFOLIATE: To cause the leaves of a tree (or other plant) to fall off, especially by the use of chemical spray or dust.

EFFLUENT STREAM: A stream flowing out of another or forming the outlet of a lake.

ESTER: A compound formed by the reaction of an acid and an alcohol, generally accompanied by the elimination of water.

EVAPOTRANSPIRATION: A combination of the actions of evaporation and transpiration of water from plants and nearby soils. Evaporation is vaporization of water from plant surfaces and soils. Transpiration is a physiological process of evaporation from plant pores.

GROUND WATER: Water residing in the interstices of soil and rock below the ground surface.

HERBACEOUS: A plant having little or no woody tissue and usually persisting for a single season.

HERBICIDE: A chemical used to control, suppress, or kill plants, or to severely interrupt their normal growth processes.

INFILTRATION: The downward entry of water into the soil.

INFLUENT STREAM: A stream or stretch of a stream is Influent with respect to ground water if it contributes water to the zone of saturation.

LEACHING: The vertical or downward movement of chemicals through soil by water.

MICROBIAL DEGRADATION: The breakdown by bacteria of chemical substances into simpler components.

MOBILITY (HERBICIDE): The capability of a herbicide to be moved easily within soil, vertically or laterally, with the normal movement of water.

NONPOINT SOURCE: A diffuse source of pollutants resulting from the activities of man over a relatively large area, the effects of which normally must be addressed or controlled by a management or conservation practice.

NONTARGET VEGETATION: Vegetation which is not targeted for control with various treatments.

PATHOGENS: A specific causative agent of disease, such as a bacterium or virus.

PERSISTENCE: The resistance of a herbicide to metabolic and environmental degradation.

pH: A numeric value that gives the relative acidity or alkalinity of a substance on a 0 to 14 scale with the neutral point at 7.0. Values lower than 7.0 show the presence of acids, and values greater than 7.0 show the presence of alkalis.

PHOTODECOMPOSITION (PHOTODEGRADATION): The breakdown of a substance, especially a chemical compound, into simpler components by the action of sunlight.

POINT SOURCE: Any discernible, confined or discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, or vessel or other floating craft, from which pollutants are or may be discharged.

RESIDUE: That quantity of herbicide, its degradation products, and/or its metabolites remaining on or in the soil, plant parts, animal tissues, whole organisms, and surfaces.

RIPARIAN: Pertaining to or located along a streambank or other water bodies, such as ponds, lakes, reservoirs, or marshes.

VOLATILITY: A measurement of the tendency of a herbicide to vaporize into the atmosphere.

WEED: A plant growing where it is not desired.

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Montana Weed Control Legislation



APPENDIX A

Noxious Weed Trust Fund

Programmatic Environmental Impact Statement

**MONTANA NOXIOUS WEED
TRUST FUND ACT
AND
ADMINISTRATIVE RULES**



**STATE OF MONTANA
DEPARTMENT OF AGRICULTURE
HELENA, MONTANA**

JULY, 1991

MONTANA NOXIOUS WEED TRUST FUND ACT

Title 80, Chapter 7

Sections

80-7-801 through 80-7-821

M.C.A. 1985

Amended 1991

AND RULES

Rules 4.5.101 through 4.5.113

State of Montana
Department of Agriculture
Agricultural and Biological Sciences Division
Capitol Station
Helena, MT 59620-0205
(406) 444-2944

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MONTANA NOXIOUS WEED TRUST FUND ACT

80-7-801. Definitions. As used in this part, the following definitions apply:

- (1) "Department" means the department of agriculture established in 2-15-3001.
- (2) "Herbicide" means a substance or mixture of substances for preventing, destroying, repelling, or mitigating any weed, as defined in 80-8-102. The term does not include herbicides labeled only for home, yard, or garden use and sold in containers of less than 10 pounds or 1 gallon.
- (3) "Noxious weed" means any weed defined and designated as a noxious weed by rule of the department.
- (4) "Retail value" means the suggested or retail price to the consumer of a given herbicide as established by the registrant, or as determined by a survey of dealers conducted by the department.
- (5) "Sale" includes only the sale of a herbicide to an applicator or consumer. Sales between or to distributors, dealers, or retailers are not included.

80-7-802. Rules. The department may adopt rules necessary to implement this part.

80-7-803 and 80-7-804 reserved.

80-7-805. Noxious Weed Management Advisory Council. (1) The director of the department shall appoint a noxious weed management advisory council to provide advice to the department concerning the administration of this part.

(2) If appointed, the council must be composed of nine members, as follows:

- (a) the director of the department of agriculture, who shall serve as chairman;
- (b) one member representing livestock production;
- (c) one member representing agriculture crop production;
- (d) one member from a sportsman/wildlife group;
- (e) one member who is a herbicide dealer or applicator;

- (f) one member from a consumer group;
- (g) one member representing biological research and control interests;
- (h) one member from the Montana weed control association;
and
- (i) one at-large member from the agricultural community.

80-7-806 through 80-7-809 reserved.

80-7-810. Disposition of Proceeds. Three percent of the proceeds from the fee imposed in 61-3-510 may be retained by the county treasurer for costs of collection. The remainder must be deposited in the special revenue fund and must be expended as provided in 80-7-814. Twenty-five percent of the money deposited in the special revenue fund under this section must be used for research and development of nonchemical methods of weed management.

80-7-811. Noxious Weed Management Trust Fund. There is a noxious weed management trust fund, which must be funded from revenue collected under 80-7-812 and 80-7-813. The department shall administer the trust fund in accordance with this part.

80-7-812. Surcharge Imposed on Retail Sales of Herbicides -- Disposition of Proceeds -- Termination. (1) There is imposed a surcharge of 1 cent per dollar of the retail value of all registered herbicides sold for consumer use in the state. The volume of sales of each registered herbicide must be determined by the department from records required of pesticide dealers and retailers.

(2) The surcharge must be collected by the department on an annual calendar basis from the registrant of the herbicide and is due and payable within 30 days after notice of the amount has been given to the registrant.

(3) No registrant may be allowed to reregister a herbicide if he has failed to pay in full the surcharge on his product.

(4) The department may expend or commit not more than one-half of the annual proceeds of the surcharge as provided in 80-7-814(2) and (3). All remaining annual proceeds of the surcharge and any interest income collected must be deposited into the noxious weed management trust fund.

(5) The surcharge imposed on retail sales of herbicides in subsection (1) is terminated after the state treasurer has certified to the department that the noxious weed management trust fund has reached \$2,500,000, subject to the applicable

provisions of subsection (5)(a) or (5)(b).

(a) If the fund reaches \$2,500,000 on or before December 31, 1993, the surcharge proceeds from the sale of herbicides for calendar year 1992 must be collected and deposited in the fund, and the surcharge is terminated on December 31, 1993.

(b) If the fund reaches \$2,500,000 after December 31, 1993, the surcharge is terminated after the surcharge proceeds from the sale of herbicides for the calendar year preceding the year in which the fund reaches \$2,500,000 have been collected and deposited in the fund.

(6) The termination of the surcharge on retail sales of herbicides does not:

(a) prevent the department from expending one-half of the annual herbicide surcharge proceeds as provided in this section within or for the fiscal year following the termination of the surcharge;

(b) prevent the department from expending the proceeds as provided in 80-7-814 within or for the fiscal year following the termination of the surcharge;

(c) prevent the deposit of other funds or proceeds authorized by this chapter into the noxious weed management trust fund; or

(d) prevent the department from expending the interest or revenue generated by the trust fund as provided in 80-7-814.

80-7-813. Acceptance and Expenditure of Gifts and Other Funds.

The department may accept gifts, grants, contracts, or other funds designated for noxious weed management. Such funds may be expended to support any weed management project or may be deposited in the noxious weed management trust fund.

80-7-814. Administration and Expenditure of Funds. (1) Money deposited in the noxious weed management trust fund may not be committed or expended until the principal reaches \$2,500,000, except as provided by 80-7-815 in case of a noxious weed emergency. Once this amount is accumulated, any interest or revenue generated by the trust fund and by other funding measures provided by this part must be deposited in the special revenue fund and may be expended for noxious weed management projects in accordance with this section, so long as the principal of the trust fund remains at least \$2,500,000.

(2) The department may expend funds under this section through grants or contracts to communities, weed control districts, or

other entities it considers appropriate for noxious weed management projects. A project is eligible to receive funds only if the county in which the project occurs has funded its own weed management program with a levy in an amount not less than 1.6 mills or an equivalent amount from another source or by an amount of not less than \$100,000 for first class counties, as defined in 7-1-2111.

(3) The department may expend funds without the restrictions specified in subsection (2) for the following:

(a) employment of a new and innovative noxious weed management project or the development, implementation, or demonstration of any noxious weed management project that may be proposed, implemented, or established by local, state, or national organizations, whether public or private. Such expenditures must be on a cost-share basis with such organizations;

(b) cost-share noxious weed management programs with local weed control districts;

(c) special grants to local weed control districts to eradicate or contain significant noxious weeds newly introduced into the county. These grants may be issued without matching funds from the district.

(d) costs of collecting the surcharge imposed by 80-7-812, not to exceed 3% of the total surcharge proceeds;

(e) administrative expenses incurred by the noxious weed management advisory council;

(f) any project recommended by the noxious weed management advisory council, if the department determines the project will significantly contribute to the management of noxious weeds within the state; and

(g) grants to the agricultural experiment station and the cooperative extension service for crop weed management research, evaluation, and education.

(4) The agricultural experiment station and cooperative extension service shall submit annual reports on current projects and future plans to the noxious weed management advisory council.

(5) In making expenditures under subsections (2) and (3), the department must give preference to weed control districts and community groups.

(6) If the noxious weed management trust fund is terminated by

law, the money in the fund must be divided between all counties according to rules adopted by the department for that purpose.

80-7-815. Noxious Weed Emergency -- Expenditure Authorized. (1) If a new and potentially harmful noxious weed is discovered growing in the state and is verified by the department, the governor may declare a noxious weed emergency. In the absence of necessary funding from other sources, this declaration authorizes the department to allocate up to \$150,000 of the principal of the noxious weed management trust fund to government agencies for emergency relief to eradicate or confine the new noxious weed species.

(2) If such expenditure causes the principal of the trust fund to fall below \$2,500,000, it must be replenished by proceeds of the surcharge imposed in 80-7-812 or, if the surcharge has been terminated as provided in 80-7-812(5), by the interest or revenue generated by the trust fund, by the other revenues provided by this part, or by revenues obtained from the fee imposed by 61-3-510, as determined by the department.

80-7-816 through 80-7-820 reserved.

80-7-821. Penalty -- Enforcement. (1) A person who violates any provision of 80-7-812 is guilty of a misdemeanor and upon conviction is punishable by a fine of not less than \$500 or more than \$2,000 or by imprisonment for not less than 30 days or more than 6 months, or by both such fine and imprisonment. Upon conviction, the court shall order payment of any unpaid surcharge, together with such interest and costs as the court considers appropriate.

(2) The county attorney of the county in which the offense occurred or the attorney general shall prosecute this action.

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Note: Other applicable Montana Codes that pertain to this act are 61-3-510 and 80-7-508, MCA.

R U L E S

Noxious Weed Trust Fund Sub-Chapter 1

4.5.101. Definitions. When used in these rules, unless a different meaning clearly appears from the context:

(1) "Department" means the department of agriculture provided for in 2-15-3001, MCA.

(2) "Weed management" or "control" means the planning and implementation of a coordinated program for the containment, suppression, and where possible, eradication of noxious weeds.

(3) "Advisory council" means the noxious weed management advisory council provided for in 80-7-805, MCA.

(4) "Project" means a planned undertaking which involves one or more renewable resources at an identified site or geographic location in Montana.

(5) "Project sponsor" means the local state or national organization, either public or private, supporting a project.

(6) "Renewable resource" means all land used for domestic livestock grazing, timber, or crop production, recreation, or wildlife and all water resources.

(7) "Public benefits" means those benefits that accrue to persons other than the grant recipient and enhance the common well-being of the people of Montana.

(8) "Tangible returns" means either monetary or non-monetary returns that will accrue to the state.

(9) "Community group" means three or more private landowners or federal, state, or local entities working together to control noxious weeds.

(10) "Noxious weed emergency" means a new and potentially harmful noxious weed growing in the state that has been verified by the department and declared an emergency as provided for in 80-7-815, MCA. (History: Sec. 80-7-802, MCA; IMP, Sec. 80-7-801 & 80-7-811, MCA; NEW, 1986 MAR p. 651, Eff. 4/25/86.)

4.5.102. Application Procedure. (1) The department will specify funding cycles and application deadlines as necessary.

(2) The department may return an insufficient or incomplete proposal for correction or completion. The department may provide the applicant with reasons for the proposal's return and

a brief description of the information required in order to make the proposal correct or complete, or both. If these corrections or completions, or both, are not made, the proposal will not be evaluated.

(3) Proposals which more closely fit the legislative authority of another loan or grant program within state government will be referred to that program for review.

(4) The applicant may request assistance from the department in completing the application. The department will provide such assistance, the level of which will be determined by availability of staff and funds.

(5) The advisory council will review and rank proposed projects according to the guidelines and criteria described in ARM 4.5.108. Advisory council recommendations will be submitted to the department for final ranking. The applicant will receive written notification from the department of the action taken on the proposal. (History: Sec. 80-7-802, MCA; IMP, Sec. 80-7-814, MCA; NEW, 1986 MAR p.651, Eff. 4/25/86.)

4.5.103. Application Content For Grants. All applications for grants shall contain:

- (1) Name, address, and telephone number of the project sponsor, project manager and liaison (if different than manager).
- (2) Title or name of the proposed project.
- (3) Location of proposed project.
- (4) A brief description of the history and background of the project.
- (5) A discussion of the need and urgency for the project and why it is best means to achieve the desired results.
- (6) Objectives of the project and desired accomplishments.
- (7) Discussion of the project's technical feasibility.
- (8) Amount of money to be requested for a grant. A statement indicating the amount of funding available from other sources. If no other funding is available, the applicant must give the reasons.
- (9) Proof, where appropriate, the applicant has the cooperation of all landholders within the project area including federal, state, and private entities.
- (10) A statement indicating both public and tangible benefits

which would accrue as a result of the proposed project.

(11) An evaluation of the project as required in ARM 4.5.105 and 4.5.106.

(12) A statement that the project sponsor, if the grant receives department approval, is willing to enter into a contract with the department for utilization of grant funds. (History: Sec. 80-7-802, MCA; IMP, Sec. 80-7-814, MCA; NEW, 1986 MAR p. 651, Eff. 4/25/86.)

4.5.104. Technical Feasibility of Projects. Technical data and information to be provided in the proposal shall include but is not limited to the following:

(1) A thorough discussion of the work plan including the purpose, location and schedule of major project phases.

(2) A listing of herbicides, biological control agents, or cultural methods used for weed control within the project area, where appropriate. This description may include prior field investigations and research information to support the proposal.

(3) Educational programs that will be conducted in conjunction with the project to increase weed awareness and improve weed control techniques of county residents.

(4) Maps, drawings, charts, tables, etc., used as a basis for project planning and implementation.

(5) A map showing land ownership associated with the project; and

(6) Description of other management alternatives and applicant's consideration of those alternatives.

(7) The department may request any additional information deemed necessary to document technical feasibility. (History: Sec. 80-7-802, MCA; IMP, Sec. 80-7-814, MCA; NEW, 1986 MAR p. 651, Eff. 4/25/86.)

4.5.105. Project Evaluation. (1) All project sponsors shall document the results of the project and the impact on the state and/or renewable resource. The amount of information required for evaluation of the technical, economic, environmental, financial and other factors may vary depending on the size and complexity of the project. The department may advise the applicant of the amount of documentation and evaluation necessary. (History: Sec. 80-7-802, MCA; IMP, Sec. 80-7-814, MCA; NEW, 1986 MAR p. 651, Eff. 4/25/86.)

4.5.106. Economic Assessment of Projects. (1) The projects which receive funding shall demonstrate tangible return to the state of Montana or its citizens.

(2) The applicant shall document current benefit and cost data. (History: Sec. 80-7-802, MCA; IMP, Sec. 80-7-814, MCA; NEW, 1986 MAR p. 651, Eff. 4/25/86.)

4.5.107. Legal Requirements. (1) The applicant is required to follow all statutory and regulatory standards. (History: Sec. 80-7-802, MCA; IMP, Sec. 80-7-814, MCA; NEW, 1986 MAR p. 651, Eff. 4/25/86.)

4.5.108. Ranking of Projects. (1) The advisory council shall utilize a scoring system to rank all projects in regard to how well they meet the criteria for the program.

(2) The advisory council shall consider the following criteria in ranking projects for funding.

(a) Projects which meet requirements specified in section 80-7-814, MCA, of the Noxious Weed Trust Fund Act.

(b) Projects that involve community groups and weed districts.

(c) Projects which can be utilized statewide and will provide the most tangible returns to the county or state.

(d) Projects in areas where county weed district funding sources for noxious weed control are limited.

(e) Projects which include educational programs to increase weed awareness and improve weed control techniques.

(f) Projects which involve an integrated weed management plan including biological, cultural, and chemical control.

(g) Projects which will enhance the renewable resources.

(h) Projects which include matching funds (including in-kind services) from private, state, and/or federal entities.

(i) Projects which have not previously received funds from the program.

(j) Projects whose results will provide public benefits.

(k) Projects with a long term effect on natural resources.

(l) Projects which involve noxious weed emergencies.

(3) The results of this scoring system will be submitted to the department for final ranking and determination of funding priority for grant requests. The department will use the same criteria in ranking the proposals. (History: Sec. 80-7-802, MCA; IMP, Sec. 80-7-814, MCA; NEW, 1986 MAR p. 651, Eff. 4/25/86.)

4.5.109. Reporting And Monitoring Procedures. (1) The project sponsor or project manager shall monitor the progress and results of the project and evaluate its overall effectiveness. The project sponsor shall submit to the department quarterly progress and fiscal reports. The department will conduct annual field evaluations. If the department determines that improper progress or fiscal reports have been filed, the project sponsor shall initiate necessary corrective action. (History: Sec. 80-7-802, MCA; IMP, Sec. 80-7-814, MCA; NEW, 1986 MAR p. 651, Eff. 4/25/86.)

4.5.110. Noxious Weed List (Is Hereby Repealed). (History: Sec. 80-7-802, IMP, Sec. 08-7-821, MCA; NEW, 1986 MAR p. 651, Eff. 4/25/86; REP, 1988 MAR p. 268, EFF. 2/12/88.)

4.5.111. Noxious Weed Identification And Verification. (1) The department will identify new and potentially harmful noxious weeds based on characteristics which make the plant undesirable, troublesome, and/or difficult to control in cropland, rangeland, forestry, industrial, recreational or non-crop sites.

(2) The department shall verify the existence of a noxious weed in Montana in the following manner:

(a) Verification of location of the infestation based on herbarium records.

(b) Scientific identification of the plant by a botanist or weed scientist and by the concurrence of another botanist or weed scientist, or

(c) Submission of a plant by any person which is scientifically identified by the scientists of the Montana State University or University of Montana Herbarium.

(History: Sec. 80-7-802, MCA; IMP, 80-7-812, MCA; NEW, 1986 MAR p. 651, Eff. 4/25/86.)

4.5.112. Noxious Weed Management Council. (1) The director of the department shall serve as chairman and also appoint the members of the noxious weed management council. Each appointed member shall serve a term of three years beginning 1986 except those members who are replacing members who resigned their membership prior to the expiration of their term or except for the provisions in subpart (2).

(2) The following members shall initially serve an initial term of one year: bio control, dealer or applicator. The following members shall serve an initial term of two years livestock, weed control and sports/wildlife. The following members shall serve an initial term of three years grain, consumer, and agriculture representatives at large. Following the completion of the first term the subsequent terms shall be three years. (History: Sec. 80-7-802, MCA; IMP, Sec. 80-7-805, MCA; NEW, 1986 MAR p. 651, Eff. 4/25/86.)

4.5.113. Dealer Record Requirements. (1) Dealers must submit to the department annually, a report of the sale of all herbicides, except for products solely registered for home, yard, lawn and garden use. The report must include the total volume sold, the trade name, the company name, and the EPA registration number or the type of formulation of each individual product. The herbicide report must be submitted to the department by January 31 of the following year. The reports shall be made on the standard forms provided by the department or on forms approved by the department. (History: Sec. 80-8-105 and 80-7-802 MCA; TRANS from ARM 4.10.504 (5)(b): Eff. 12/31/88.)

**COUNTY NOXIOUS WEED
CONTROL ACT
AND
ADMINISTRATIVE RULES**



**STATE OF MONTANA
DEPARTMENT OF AGRICULTURE
HELENA, MONTANA**

JULY, 1991

COUNTY NOXIOUS WEED CONTROL ACT

Title 7, Chapter 22

Sections

7-22-2101 through 7-22-2153

M C A

Amended 1991

AND RULES

Rules 4.5.201 through 4.5.203

State of Montana
Department of Agriculture
Agricultural and Biological Sciences Division
Capitol Station
Helena, MT 59620-0205
(406) 444-2944

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COUNTY NOXIOUS WEED CONTROL ACT

7-22-2101. Definitions. As used in this part, unless the context indicates otherwise, the following definitions apply:

- (1) "Board" means a district weed board created under 7-22-2103.
- (2) "Commissioners" means the board of county commissioners.
- (3) "Department" means the department of agriculture provided for in 2-15-3001.
- (4) "District" means a weed management district organized under 7-22-2102.
- (5) "Native plant" means a plant endemic to the state of Montana.
- (6) "Native plant community" means an assemblage of native plants occurring in a natural habitat.
- (7) (a) "Noxious weeds" or "weeds" means any exotic plant species established or that may be introduced in the state which may render land unfit for agriculture, forestry, livestock, wildlife, or other beneficial uses or that may harm native plant communities and that is designated:
 - (i) as a statewide noxious weed by rule of the department; or
 - (ii) as a district noxious weed by a board, following public notice of intent and a public hearing.(b) A weed designated by rule of the department as a statewide noxious weed must be considered noxious in every district of the state.
- (8) "Person" means an individual, partnership, corporation, association, or state or local government agency or subdivision owning, occupying, or controlling any land, easement, or right-of-way, including any county, state, or federally owned and controlled highway, drainage or irrigation ditch, spoil bank, borrow pit, or right-of-way for a canal or lateral.
- (9) "Supervisor" means the person employed by the board to conduct the district noxious weed management program and supervise other district employees.
- (10) "Weed management" or "control" means the planning and implementation of a coordinated program for the containment, suppression, and, where possible, eradication of noxious weeds.

7-22-2102. Weed Management Districts Established. A weed management district shall be formed in every county of this state and shall include all the land within the boundaries of the county, except that a weed management district may include more than one county through agreement of the commissioners of the affected counties.

7-22-2103. District Weed Board -- Appointment and Term. (1) The commissioners shall appoint a district weed board.

(2) The commissioners shall, at a public meeting, pass a resolution establishing the number of members of the district weed board and the terms of the appointments. The board must consist of at least three members and no more than nine members, and the members of the board must be residents of the district. A majority of the board members must be rural agricultural land owners.

(3) The county extension agent in each county and other interested individuals may be appointed to serve as nonvoting members of that district's weed board.

(4) The board members are public officers.

(5) The board may call upon the county attorney for legal advice and services as it may require.

7-22-2104. Term of Office. (1) Except as provided in subsection (2), a member of a district weed board serves a term of 3 years and until the qualification of his successor. The term of office begins January 1.

(2) When a three-member weed board is established, the initial board members serve terms of 1, 2, and 3 years, respectively, as designated by the commissioners. When a five-member weed board is established, two of the initial members serve terms of 1 year, two serve terms of 2 years, and one serves a term of 3 years. After expiration of an initial term of office, the successor serves a 3-year term as provided in subsection (1).

7-22-2105. Organization of District Weed Board and Compensation.

(1) The board shall organize by choosing a chairman and a secretary. The secretary may or may not be a member of the board.

(2) Salary, per diem, and mileage of such board members shall be set by resolution of the commissioners.

(3) A majority of the board constitutes a quorum for the conduct of business.

7-22-2106. Renumbered 7-22-2115 by Code Commissioner, 1985.

7-22-2107. Renumbered 7-22-2116 by Code Commissioner, 1985.

7-22-2108. Renumbered 7-22-2117 by Code Commissioner, 1985.

7-22-2109. Powers and Duties of Board. (1) The board may:

(a) employ a supervisor and other employees as necessary and provide for their compensation;

(b) purchase such chemicals, materials, and equipment and pay other operational costs as it determines necessary for implementing an effective weed management program. Such costs must be paid from the noxious weed fund.

(c) determine what chemicals, materials, or equipment may be made available to persons controlling weeds on their own land. The cost for such chemicals, materials, or equipment must be paid by such person and collected as provided in this part.

(d) enter into agreements with the department for the control and eradication of any new exotic plant species not previously established in the state which may render land unfit for agriculture, forestry, livestock, wildlife, or other beneficial use if such plant species spreads or threatens to spread into the state; and

(e) perform other activities relating to weed management.

(2) The board shall:

(a) administer the district's noxious weed program;

(b) establish management criteria for noxious weeds on all land within the district;

(c) make all reasonable efforts to develop and implement a noxious weed program covering all land within the district owned or administered by a federal agency.

7-22-2110. Administrative Hearing -- Appeals. (1) A person adversely affected by any notice, action, or order of the board may request an administrative hearing before the board. The board shall hold a hearing within 30 days of the request. Participants may be represented by legal counsel. The board shall make a record of the proceeding and enter its order and findings within 7 days after the hearing.

(2) An order of the board may be appealed to the commissioners within 30 days from the time the order is entered.

The commissioners shall hear such appeal within 30 days after the notice of appeal and shall render their order and findings within 7 days after such hearing. Participants may be represented by legal counsel.

(3) Within 30 days after the commissioners render their order and findings, the person adversely affected may file a petition in district court requesting that the order and findings of the commissioners be set aside or modified. The court may affirm, modify, or set aside the order complained of, in whole or in part.

7-22-2111. (Temporary) Liability Restrictions. A district, as defined in 7-22-2101, is liable for damages caused by its use of herbicides only for an act or omission that constitutes gross negligence. The provisions of 2-9-305 apply to board members, supervisors, and employees of a district. (Terminates July 1, 1995 -- sec. 7, Ch. 530, L. 1991.)

7-22-2112. (Temporary) Information on Herbicide Use. The district must provide information on protective clothing, health hazards, and proper application techniques to mixers, loaders, and applicators of herbicides and make information available for review by the public at the district office. (Terminates July 1, 1995 -- sec. 7, Ch. 530, L. 1991.)

7-22-2113 and 7-22-2114 reserved.

7-22-2115. Noxious Weeds and Seeds Declared Nuisance. Noxious weeds and the seed of any noxious weed are hereby declared a common nuisance.

7-22-2116. Unlawful to Permit Noxious Weeds to Propagate. It is unlawful for any person to permit any noxious weed to propagate or go to seed on his land, except that any person who adheres to the noxious weed management program of his district or who has entered into and is in compliance with a noxious weed management agreement is considered to be in compliance with this section.

7-22-2117. Violations. (1) Any person who in any manner interferes with the board or its authorized agent in carrying out the provisions of this part or who refuses to obey an order or notice of the board is guilty of a misdemeanor, and upon conviction thereof, he shall be fined not to exceed \$100 for the first offense and not less than \$100 or more than \$200 for each subsequent offense.

(2) All fines, bonds, and penalties collected under the provisions of this part, except those collected by a justice's court, shall be paid to the county treasurer of each county and placed by him to the credit of a fund to be known as the noxious weed fund.

7-22-2118 through 7-22-2120 reserved.

7-22-2121. Weed Management Program. (1) The noxious weed management program must be based on a plan approved by the board.

(2) The noxious weed management plan must:

(a) specify the goals and priorities of the program;

(b) review the distribution and abundance of each noxious weed species known to occur within the district and specify the locations of new infestations and areas particularly susceptible to new infestations;

(c) specify pesticide management goals and procedures, including but not limited to water quality protection, public and worker safety, equipment selection and maintenance, and pesticide selection, application, mixing, loading, storage, and disposal; and

(d) estimate the personnel, operations, and equipment costs of the proposed program.

(3) The board shall provide for the management of noxious weeds on all land or rights-of-way owned or controlled by a county or municipality within the confines of the district. It shall take particular precautions while managing the noxious weeds to preserve beneficial vegetation and wildlife habitat. Where at all possible, methods for such control shall include cultural, chemical, and biological methods.

(4) The board may establish special management zones within the district. The management criteria in such zones may be more or less stringent than the general management criteria for the district.

7-22-2122. Repealed. Sec. 32, Ch. 607, L. 1985.

7-22-2123. Procedure in a Case of Noncompliance. (1) Where complaint has been made or the board has reason to believe that noxious weeds described in this part are present upon a person's land within the district in violation of the law, that person must be notified by mail or telephone of the complaint and the board may request inspection of such land. The board or its authorized agent and the landowner or his representative shall inspect the land at an agreeable time, within 10 days of notification of the landowner. If after reasonable effort the board is unable to gain cooperation of the person, the board or its authorized agent may enter and inspect the land to determine if the complaint is valid.

(2) If noxious weeds are found, the board or supervisor shall notify the person or his representative and seek voluntary compliance with the district weed control program. If voluntary compliance is not possible, notice of noncompliance must be sent to the person by certified mail.

(3) The notice must specify:

(a) the basis for the determination of noncompliance;

(b) the geographic location of the area of noncompliance, by legal description or other reasonably identifiable description;

(c) measures to be undertaken in order to comply with the district's management criteria;

(d) a reasonable period of time, not less than 10 days, in which compliance measures must be initiated; and

(e) the right of the person to request, within the time specified in subsection (3) (d), an administrative hearing as provided by 7-22-2110.

(4) A person is considered in compliance if he submits and the board accepts a proposal to undertake specified control measures and is in compliance for so long as he performs according to the terms of the proposal. If the measures proposed to be taken extend beyond the current growing season, the proposal and acceptance must be in writing.

(5) In accepting or rejecting a proposal, the board shall consider the economic impact on the person and his neighbors, practical biological and environmental limitations, and alternative control methods to be used.

7-22-2124. Destruction of Weeds by Board. (1) If corrective action is not taken and no proposal is made and accepted or no request for an administrative hearing is made within the time specified in the notice, the board may forthwith enter upon the person's land and institute appropriate control measures.

In such case the board shall submit a bill to the person, itemizing man-hours of labor, material, and equipment time, together with a penalty not exceeding 10% of the total cost incurred. Labor and equipment must be valued at the current rate paid for commercial management operations in the district. The bill must specify and order a payment due date of 30 days from the date the bill is sent.

(2) A copy of the bill must also be submitted by the board to the county clerk and recorder.

(3) If a person receiving an order to take corrective action requests an administrative hearing, the board may not institute control measures until the matter is finally resolved, except in case of an emergency. In such a case, the person is liable for costs as provided in subsection (1) only to the extent determined appropriate by the board, commissioners, or court that finally resolves the matter.

7-22-2125. Repealed. Sec. 32, Ch. 607, L. 1985.

7-22-2126. Embargo. The board may establish voluntary embargo programs to reduce the spread of noxious weeds within the district or the introduction of noxious weeds into the district.

7-22-2127. Repealed. Sec. 32, Ch. 607, L. 1985.

7-22-2128 and 7-22-2129 reserved.

7-22-2130. Weed District Supervisor Training. Within the limitations of available funds, the board shall ensure that the weed district supervisor obtains training to properly implement the noxious weed management program described in 7-22-2121. The department shall specify through rulemaking the level and type of training necessary to fulfill this requirement.

7-22-2131 through 7-22-2140 reserved.

7-22-2141. Noxious Weed Fund Authorized. (1) The commissioners of each county in this state shall create a noxious weed management fund, to be designated the "noxious weed fund".

(2) This fund shall be kept separate and distinct by the county treasurer.

7-22-2142. Sources of Money For Noxious Weed Fund. (1) The commissioners may create the noxious weed fund and provide sufficient money in the fund for the board to fulfill its duties, as specified in 7-22-2109, by:

(a) appropriating money from the general fund of the county;

(b) at any time fixed by law for levy and assessment of taxes, levying a tax not exceeding 2 mills on the dollar of total taxable valuation in the county. The tax levied under this subsection must be identified on the assessment as the tax that will be used for noxious weed control; and

(c) levying a tax in excess of 2 mills if authorized by a majority of the qualified electors voting in an election held for this purpose pursuant to 7-6-2531 through 7-6-2536.

(2) The proceeds of the noxious weed control tax must be used solely for the purpose of managing noxious weeds in the county and must be designated to the noxious weed fund.

(3) Any proceeds from work or chemical sales must revert to the noxious weed fund and must be available for reuse within that fiscal year or any subsequent year.

(4) The commissioners may accept any private, state, or federal gifts, grants, contracts, or other funds to aid in the management of noxious weeds within the district. These funds must be placed in the noxious weed fund.

7-22-2143. Determination of Cost of Weed Control Program. Based on the board's recommendations, the commissioners shall determine and fix the cost of the control of noxious weeds in the district, whether the same be performed by the individual landowners or by the board.

7-22-2144. Payment of Cost of Weed Control Program. The total cost of such control shall be paid from the noxious weed fund. The cost of controlling such weeds growing along the right-of-way of a state or federal highway shall, upon the presentation by the board of a verified account of the expenses incurred, be paid from the state highway fund in compliance with 7-14-2132 and any agreement between the board and the department of highways. Costs attributed to other lands within the district shall be assessed to and collected from the responsible person as set forth in 7-22-2116.

7-22-2145. Expenditures From Noxious Weed Fund. (1) The noxious weed fund must be expended by the commissioners at the time and in the manner as is recommended by the board to secure the control of noxious weeds.

(2) Warrants upon the fund must be drawn by the board. Warrants may not be drawn except upon claims duly itemized by the claimant, except payroll claims that must be itemized and certified by the board, and each claim must be presented to the commissioners for approval before the warrant is countersigned by the commissioners.

7-22-2146. Financial Assistance to Persons Responsible For Weed Control. (1) The commissioners, upon recommendation of the board, may establish cost-share programs with any person, specifying costs that may be paid from the noxious weed fund and costs that must be paid by the person. Cost-share programs may be established for special projects and for established management zones.

(2) (a) When under the terms of any voluntary agreement, whether entered into pursuant to 7-22-2123 or otherwise, or under

any cost-share program entered pursuant to this section a person incurs any obligation for materials or services provided by the board, the board shall submit a bill to the person, itemizing man-hours of labor, material, and equipment time. The bill must specify and order a payment due date not less than 30 days from the date the bill is sent.

(b) A copy of the bill must be submitted by the board to the county clerk and recorder. If the sum to be repaid by the person billed is not repaid on or before the date due, the county clerk and recorder shall certify the amount thereof, with the description of the land to be charged, and shall enter the sum on the assessment list as a special tax on the land, to be collected in the manner provided in 7-22-2148.

7-22-2147. Repealed. Sec. 32, Ch. 607, L. 1985.

7-22-2148. Tax Liability For Payment of Weed Control Expenses.

(1) The expenses referred to in 7-22-2124 shall be paid by the county out of the noxious weed fund, and unless the sum to be repaid by the person billed under 7-22-2124 is repaid on or before the date due, the county clerk shall certify the amount thereof, with the description of the land to be charged, and shall enter the same on the assessment list of the county as a special tax on the land. If the land for any reason is exempt from general taxation, the amount of such charge may be recovered by direct claim against the lessee and collected in the same manner as personal taxes. When such charges are collected, they shall be credited to the noxious weed fund.

(2) In determining what lands are included as land covered by the special tax and are described in the certificate of the county clerk, it is presumed that all work done upon any of the land of any one landowner is for the benefit of all of the land within the district belonging to the owner, together with the parcel upon which the work was done, and the amount certified becomes a tax upon the whole thereof.

7-22-2149. Responsibility For Assessments And Taxes For Weed Control Levied on Leased State Lands. The lessee of agricultural state land is responsible for assessments and taxes levied by the board of county commissioners for the district as provided in 77-6-114.

7-22-2150. Cooperation With State And Federal-Aid Programs. The board is empowered to cooperate with any state or federal-aid program that becomes available. Under such a plan of cooperation, the direction of the program shall be under the direct supervision of the board of the district in which the program operates.

7-22-2151. Cooperative Agreements. (1) Any state agency controlling land within a district, including the department of highways; the department of state lands; the department of fish, wildlife, and parks; the department of institutions; the department of natural resources and conservation; and the university system, shall enter into a written agreement with the board. The agreement must specify mutual responsibilities for noxious weed management on state-owned or state-controlled land within the district.

(2) The board and the governing body of each incorporated municipality within the district shall enter into a written agreement and shall cooperatively plan for the management of noxious weeds within the boundaries of the municipality. The board may implement management procedures described in the plan within the boundaries of the municipality for noxious weeds only. Control of nuisance weeds within the municipality remains the responsibility of the governing body of the municipality, as specified in 7-22-4101.

(3) A board may develop and carry out its noxious weed management program in cooperation with boards of other districts, with state and federal governments and their agencies, or with any person within the district. The board may enter into cooperative agreements with any of these parties.

7-22-2152. Revegetation of Rights-Of-Way And Disturbed Areas.

(1) Any state agency or local government unit approving a mine, major facility, transmission line, solid waste facility, highway, subdivision, or any other development resulting in significant disturbance of land within a district shall notify the board.

(2) Whenever any person or agency disturbs vegetation on an easement or right-of-way within a district by construction of a road, irrigation or drainage ditch, pipeline, transmission line, or other development, the board shall require that the disturbed areas be seeded, planted, or otherwise managed to reestablish a cover of beneficial plants.

(3) (a) The person or agency disturbing the land shall submit to the board a written plan specifying the methods to be used to accomplish revegetation. The plan must describe the time and method of seeding, fertilization practices, recommended plant species, use of weed-free seed, and the weed management procedures to be used.

(b) The plan is subject to approval by the board, which may require revisions to bring the revegetation plan into compliance with the district weed management plan. Upon approval by the board, the revegetation plan must be signed by the chairman of the board and the person or agency responsible for the disturbance and constitutes a binding agreement between the

board and such person or agency.

7-22-2153. Voluntary Agreements For Control of Noxious Weeds Along Roads. (1) Any person may voluntarily seek to enter into an agreement for the management of noxious weeds along a state or county highway or road bordering or running through his land. The supervisor may draft such an agreement upon the request of and in cooperation with the person; however, the agreement must, in the board's judgment, provide for effective weed management. The weed management agreement must be signed by the person and, upon approval of the board, by the chairman. An agreement involving a state highway right-of-way must also be signed by a representative of the department of highways.

(2) The agreement must contain a statement disclaiming any liability of the board and, if applicable, the department of highways for any injuries or losses suffered by the person in managing noxious weeds on the state or county highway right-of-way. The signed agreement transfers responsibility for managing noxious weeds on the specified section of right-of-way from the board to the person signing the agreement. If the board later finds that the person has failed to adhere to the agreement, the board shall issue an order informing the person that the agreement will be void and that responsibility for the management of noxious weeds on the right-of-way will revert to the board unless the person complies with the provisions of the agreement within a specified time period.

RULES
COUNTY NOXIOUS WEED LIST
Sub-Chapter 2
Designation of Noxious Weeds

4.5.201. Designation of Noxious Weeds. (1) The department designates certain exotic plants listed in these rules as statewide noxious weeds under the County Weed Control Act 7-22-2101 (5), MCA. All counties must implement management standards for these noxious weeds consistent with weed management criteria developed under 7-22-2109 (2)(b) of the Act. The department established three categories of the noxious weeds. (History: Sec. 7-22-2101 MCA; IMP, Sec. 7-22-2101 MCA; NEW 1986, p. 337, Eff. 3/14/86; AND, 1991 MAR p. 511, Eff. 4/26/91.)

4.5.202. Category 1. (1) Category 1 noxious weeds are weeds that are currently established and generally widespread in many counties of the state. Management criteria includes awareness and education, containment and suppression of existing infestations and prevention of new infestations. These weeds are capable of rapid spread and render land unfit or greatly limit beneficial uses.

(2) The following are designated as category 1 noxious weeds:

- (a) Canada Thistle (Cirsium arvense)
- (b) Field Bindweed (Convolvulus arvensis)
- (c) Whitetop or Hoary Cress (Cardaria draba)
- (d) Leafy Spurge (Euphorbia esula)
- (e) Russian Knapweed (Centaurea repens)
- (f) Spotted Knapweed (Centaurea maculosa)
- (g) Diffuse Knapweed (Centaurea diffusa)
- (h) Dalmatian Toadflax (Linaria dalmatica)
- (i) St. Johnswort (Hypericum perforatum).

(History: Sec. 7-22-2101 MCA; IMP, Sec. 7-22-2101 MCA; NEW 1986 MAR p. 337, Eff. 3/14/86; AND, 1991 MAR p. 511, Eff. 4/26/91.)

4.5.203. Category 2. (1) Category 2 noxious weeds have recently been introduced into the state or are rapidly spreading from their current infestation sites. These weeds are capable of rapid spread and invasion of lands, rendering lands unfit for beneficial uses. Management criteria includes awareness and education, monitoring and containment of known infestations and eradication where possible.

(2) The following are designated as category 2 noxious weeds:

(a) Dyers Woad (Isatis tinctoria)

(b) Purple Loosestrife or Lythrum (Lythrum salicaria, L. virgatum, and any hybrid crosses thereof).

(c) Sulfur (Erect) Cinquefoil (Potentilla recta)

(History: Sec. 7-22-2101 and 80-7-802 MCA; MP Sec. 7-22-2101 MCA: EW 1986 MAR p. 337, Eff. 3/14/86; AND, 1989 MAR p. 899, Eff. 7/14/89; AND 1991 MAR p. 511, Eff. 4/26/91.)

4.5.204 Category 3. (1) Category 3 noxious weeds have not been detected in the state or may be found only in small, scattered, localized infestations. Management criteria includes awareness and education, early detection and immediate action to eradicate infestations. These weeds are know pests in nearby states and are capable of rapid spread and render land unfit for beneficial uses.

(2) The following are designated as category 3 noxious weeds:

(a) Yellow Starthistle (Centaurea solstitialis)

(b) Common Crupina (Crupina vulgaris)

(c) Rush Skeletonweed (Chondrilla juncea)

(History: Sec. 80-7-802 MCA; IMP, Sec. 7-22-2102 MCA; NEW 1991 MAR p.511, Eff. 4/26/91.)

Part Cross References:

Weed Control - Department of Agriculture, Title 80, Chapter 7, Part 7.
Municipal Weed Control, 7-22-4101.
Noxious Weed Management Funding, Title 80, Chapter 7, Part 8.
Embargo against introduction of noxious weed seed from other state, 80-7-701.
General authority of county commissioners, 7-5-2101.
County officers - term of office, 7-4-2205.
Nuisance, Title 27, Chapter 30.
Classification of offenses, 45-1-201.
Department of State Lands, general powers and duties, Title 77, Chapter 1, Part 3.
Mining on State Lands, Title 77, Chapter 3.
Department of Fish, Wildlife and Parks, general powers and duties, Title 87, Chapter 1, Part 2.
Department of Highways, general powers and duties, Title 60, Chapter 2, Part 7.
Highways, acquisition and disposition of property, Title 60, Chapter 4.
Highway maintenance agreements with local government, 60-2-204.
Montana Environmental Protection Act, Title 75, Chapter 1.
Montana Solid Waste Management Act, Title 75, Chapter 10, Part 2.
County Taxation, Title 7, Chapter 6, Part 25.
Department of Institutions, general powers and duties, Title 53, Chapter 1, Part 2.
University system, Title 20, Chapter 5.
Department of Natural Resources and Conservation established 2-15-3301.
Major Facility Siting Act, Title 75, Chapter 20.
Subdivisions, Title 76, Chapter 2 and 3.
Coal mining, Title 82, Chapter 3.
Oil and gas conservation, Title 82, Chapter 11.
Hard rock mining impact, Title 90, Chapter 6, Part 3.
Role and duties of county clerk, 7-4-2611.
Employment of personnel by county commissioners. 7-5-2107.

5.1\weed\county1.wp

PEIS Scoping Statement and Survey



APPENDIX B

Noxious Weed Trust Fund

Programmatic Environmental Impact Statement

SCOPING STATEMENT
PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT
FOR THE
MONTANA DEPARTMENT OF AGRICULTURE
NOXIOUS WEED TRUST FUND GRANTS PROGRAM

I. DESCRIPTION OF PROGRAM

The Montana Department of Agriculture (MDA) coordinates the Noxious Weed Trust Fund under the provisions of the Montana Noxious Weed Trust Fund Act of 1985 (80-7-801-821, Montana Code Annotated, MCA). The MDA administers the funds collected under a herbicide sales surcharge and vehicle weed fee and issues them through grants or contract funds to communities, weed districts or other entities it considers appropriate for noxious weed management projects (61-3-510, 23-2-803, MCA). Grant funding recommendations are from a nine-member Noxious Weed Advisory Council appointed by the Director of the Department of Agriculture.

The MDA has determined that this program is a major state action which requires preparation of a programmatic EIS as dictated by the Montana Environmental Policy Act (MEPA) (75-1-101, MCA) and rules (4.2.312-337 Administrative Rules of Montana (ARM)). The MDA intends to contract for preparation of a Programmatic Environmental Impact Statement (PEIS) for the Noxious Weed Trust Fund grants program.

II. CONTENT OF THE PEIS

The Department of Agriculture prepared this scoping document to inform the public of the program and seek additional public input. The department is aware of a number of issues and concerns as outlined below.

The MDA encourages public participation in the preparation of this Programmatic Environmental Impact Statement. The department requests public input on those issues outlined in Section III below. Your input will help the department focus on the significant issues and concerns related to the program and help the department select a preferred alternative.

The alternatives that may be addressed in the PEIS include: continuation of the grants program as it is currently administered, requirement of additional information from grant applicants prior to their acceptance, and requirement of additional information or data from grant applicants after the funding of a grant application. Other alternatives that may be identified during the scoping sessions and development of the PEIS.

The final PEIS will determine the future direction of the Noxious Weed Trust Fund grants program.

III. ISSUES TO BE DISCUSSED

The following issues and concerns have been identified through agency discussions and may be used as a general guideline for discussion at the scoping sessions. The department encourages submission of additional issues pertaining to the program.

1. Do the types of projects funded through the Noxious Weed Trust Fund grants program need to be investigated by an environmental review process?
 - Types of projects funded include: integrated weed management, animal grazing, herbicide use, non-chemical research, chemical research, and education.
2. What are the direct, indirect, and cumulative impacts of the possible actions financed by the Noxious Weed Trust Fund grants program?
3. Should the MDA employ an evaluation process to determine environmental impacts of individual grant proposals?
4. What criteria should the MDA use to determine whether a grant proposal requires further environmental review under MEPA?
5. What are possible alternatives to the current grants process that might ensure immediate compliance of all proposals with MEPA?
6. Does the current grants program adequately assist in managing noxious weeds?

IV. TIMING OF COMMENTS

Written comments concerning this program should be submitted to the Department no later than April 13, 1990. Direct comments (see enclosed comment sheet) to:

Barbra Mullin
Montana Department of Agriculture
Capitol Station
Helena, Montana 59620

For additional information you may contact the Environmental Management Division (406) 444-2944.

V. PUBLIC PARTICIPATION

Copies of this scoping document will be mailed to an estimated 300 individuals, agencies and organizations. The department will hold four public meetings. The purpose of these meetings is to help determine the scope of the Programmatic Environmental Impact Statement and identify issues to be addressed.

Public comments may be limited to ensure an opportunity for everyone to participate. Individuals providing verbal comments are requested to provide a copy of their comments for the record. Written comments will be accepted by the department through April 13, 1990 for those who cannot attend the public meetings.

Public meetings will be held:

March 21, 1990 - Columbus, MT 7:00 PM
Stillwater Pavillon, Columbus Fairgrounds, Columbus, MT

March 22, 1990 - Glendive, MT 7:00 PM
Community Room, County Courthouse, Glendive, MT

March 26, 1990 - Missoula, MT 7:00 PM
Community Room, Southgate Mall, Missoula, MT

March 27, 1990 - Havre, MT 7:00 PM
Iron Horse Restaurant, Havre, MT

COMMENT SHEET
MONTANA DEPARTMENT OF AGRICULTURE
NOXIOUS WEED TRUST FUND

Mailing Instructions: Please fold with the reverse side out, staple or tape, stamp and mail to the address shown. You may attach additional pages of comments as needed.

Name:

Address:

Comments on the tentative issues identifies in the scoping brochure:

Additional issues that you feel should be addressed:

What alternatives should the department consider in the Programmatic Environmental Impact Statement?

Other comments:

Do you wish to remain on the mailing list and receive additional information on this program as it is developed?

Yes _____ No _____

NOXIOUS WEED TRUST FUND PROGRAM
PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT
INTERVIEW QUESTIONS

1. Is the Noxious Weed Trust Fund (NWTF) program, as it is presently administered, an effective mechanism for distributing monies for weed control in Montana? How could the application process be refined? Is the selection process fair?
2. Do you approve of the current appropriation percentages of 60% for local co-ops, 30% for research, and 10% for education? If not, how would you re-allocate the funding?
3. Is the information asked for on the Environmental Action Checklist portion of the grant application adequate to ensure protection of area resources? What changes would you make and why?
4. Should grant monies be allocated for additional staffing to coordinate and administer a statewide noxious weed control program?
5. Should monitoring or auditing of funded projects become a requirement to document results? What else could grantors do to demonstrate the success or failure of their projects?
6. What changes would you make to the NWTF program?

ADDITIONAL QUESTIONS FOR COUNTY WEED BOARD SUPERVISORS

7. What benefit, if any, has the present weed control program had on the local economy?
8. What would be the economic impact if there were no weed control program? (Please be specific.)
9. What has been the biggest problem in dealing with the public concerning the weed control program?
10. Do you receive complaints from the public about weed spraying:
 - a. Yes What is the nature of these complaints (e.g. health effects, damage to non-target species)?
 - b. No

Montana NWTf Grants Program Project Development Guidelines and Application Form; and Project Ranking Worksheet



APPENDIX C

Noxious Weed Trust Fund

Programmatic Environmental Impact Statement

MONTANA NOXIOUS WEED GRANT PROGRAM

PROJECT DEVELOPMENT GUIDELINES

AND APPLICATION FORM

**Montana Department of Agriculture
Environmental Management Division
Noxious Weed Section
Helena, Montana 59620
(406) 444-2944**

June, 1990

TABLE OF CONTENTS

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Project Development Guidelines	
Local Cooperative Weed Management Projects.....	1
Non-Chemical Research and Demonstration Projects.....	2
Educational, Chemical Research and Other Projects.....	3
All Projects.....	5
Format for Drafting a Project Proposal (All Projects).....	6
Forms to be Completed:	
NW 1001	
NW 1002	
NW 1003	

MONTANA NOXIOUS WEED GRANT PROGRAM
PROJECT DEVELOPMENT GUIDELINES

Local Cooperative Weed Management Projects

1. Project areas should have at least one year of planning, organization and implementation prior to application.
 - Documentation of cooperation with all landowners in the project area should accompany the grant request.
 - Mapping of the area should be completed, including target weed infestations, areas previously treated and areas to be treated over the life of the project.
2. The project sponsors (weed district, conservation district, etc.) must be clearly identified.
 - A local individual must be identified as the project leader or coordinator to represent the project sponsor.
3. All project areas must be part of a county noxious weed management plan.
 - All grant monies will be distributed through a government agency (i.e. - weed district, conservation district, university, etc.)
4. All proposals must address environmental concerns of the project area.
 - Submit a completed Environmental Action Checklist (Form NW 1003) with your application.
 - Outline weed control methods to be used.
 - Give rates and timing of all herbicide applications.
 - Address proper use of herbicides in environmentally sensitive areas.
 - Project coordinators will be expected to keep an accurate accounting of all cost-share herbicide monies.
 - Remember, all commercial and governmental pesticide applicators must be properly licensed to apply herbicides. All landowners must have a farm applicator permit if they will be using a restricted use herbicide (such as Tordon) in the project area.
5. All grant requests must be accompanied by a complete budget (Form NW 1002).
 - Most projects will only be funded if some form of matching funds are available from the project sponsors and cooperators.
 - All requests to purchase equipment with grant monies must be justified in the financial narrative.

- If your grant request is for more than one year, please submit the budget outlining each year clearly in the financial narrative. Continued funding for long-term projects is based on yearly project evaluations provided by the project sponsor.

- Generally projects are not funded for more than three years.

- All indirect costs should be minimized or waived when possible. In no case will indirect costs greater than 10% be paid.

6. Education and evaluation is an important part of the program.

- Tours should be planned as the project progresses. Please notify the Department of planned tours.

- Long-term evaluation of all projects should be built into the proposal, including development of photo points or vegetation surveys. Outline how you will document evaluation of your project in the project proposal.

7. Outline the cooperator's long-term commitment to the project.

- How will the project be maintained after the funding from the grant has been completed?

Non-Chemical Research and Demonstration Projects

1. Creative proposals for investigating new techniques for weed management are encouraged by the Noxious Weed Advisory Council.

2. The project should have at least one year of planning, organization and implementation prior to application.

- Documentation of cooperators should accompany the grant request.

3. The project sponsors (university, weed district, conservation district, etc.) must be clearly identified.

- One person must be identified as the project leader or coordinator to represent the project sponsor.

4. All grant monies will be distributed through a government agency (i.e. - weed district, conservation district, university, etc.)

5. Address environmental concerns if the project includes on-the-ground weed management research and demonstration plots. If you do not feel this is necessary, please explain with a brief explanation in the proposal narrative.

If there are some environmental concerns that could be part of your project you should:

- Submit a completed Environmental Action Checklist (Form NW 1003) with your application.
- Outline weed control methods to be used.
- Give rates and timing of all herbicide applications.
- Address proper use of herbicides in environmentally sensitive areas.
- Project coordinators will be expected to keep an accurate accounting of all cost-share herbicide monies.
- Remember, all commercial and governmental pesticide applicators must be properly licensed to apply herbicides. All landowners must have a farm applicator permit if they will be using a restricted use herbicide (such as Tordon) in the project area.

6. All grant requests must be accompanied by a complete budget (Form NW 1002).

- Most projects will only be funded if some form of matching funds are available from the project sponsors and cooperators.

- All requests to purchase equipment with grant monies must be justified in the financial narrative.

- If your grant request is for more than one year, please submit the budget outlining each year clearly in the financial narrative. Continued funding for long-term projects is based on yearly project evaluations provided by the project sponsor.

- Generally projects are not funded for more than three years.

- All indirect costs should be minimized or waived when possible. In no case will indirect costs greater than 10% be paid.

7. Education and evaluation is an important part of the program.

- Long-term evaluation of all projects should be built into the proposal. Outline how you will document evaluation of your project in the project proposal.

Educational, Chemical Research and Other Projects

1. Creative proposals for investigating new techniques for weed management are encouraged by the Noxious Weed Advisory Council.

2. The project should have at least one year of planning, organization and implementation prior to application.

- Documentation of cooperators should accompany the grant request.

3. The project sponsors (university, weed district, conservation district, etc.) must be clearly identified.
 - One person must be identified as the project leader or coordinator to represent the project sponsor.
4. All grant monies will be distributed through a government agency (i.e. - weed district, conservation district, university, etc.)
5. Address environmental concerns if the project includes on-the-ground weed management research and demonstration plots. If you do not feel this is necessary, please explain with a brief explanation in the proposal narrative.

If there are some environmental concerns that could be part of your project you should:

- Submit a completed Environmental Action Checklist (Form NW 1003) with your application.
- Outline weed control methods to be used.
- Give rates and timing of all herbicide applications.
- Address proper use of herbicides in environmentally sensitive areas.
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6. All grant requests must be accompanied by a complete budget (Form NW 1002).
 - Most projects will only be funded if some form of matching funds are available from the project sponsors and cooperators.
 - All requests to purchase equipment with grant monies must be justified in the financial narrative.
 - If your grant request is for more than one year, please submit the budget outlining each year clearly in the financial narrative. Continued funding for long-term projects is based on yearly project evaluations provided by the project sponsor.
 - Generally projects are not funded for more than three years.
 - All indirect costs should be minimized or waived when possible. In no case will indirect costs greater than 10% be paid.

7. Education and evaluation is an important part of the program.
 - Long-term evaluation of all projects should be built into the proposal. Outline how you will document evaluation of your project in the project proposal.

All Projects

1. One (1) original and fourteen (14) copies* of the completed proposal should be submitted to:
 - Montana Department of Agriculture
 - Environmental Management Division
 - Attn: Barbra Mullin
 - Capitol Station
 - Helena, Montana 59620-0205
 - Proposals must include: the application form (NW 1001) should be the top page of proposal; budget detail (NW 1002), an environmental action checklist (NW 1003), if needed; and a brief write-up of the project proposal (see attached format).
 - Proposals can be submitted by: August 15, 1990, December 15, 1990, or April 15, 1991. You should consider applying during the time period the Council will be meeting closest to your area (see 2. below).
 - Incomplete proposals will be returned to the applicant.
2. The Noxious Weed Advisory Council will meet to review grant requests and you should plan to attend and present your project to the Council at this time. This also gives the Council an opportunity to ask questions on your proposal.
 - Grant hearings will be held in Miles City in mid-September, Helena in mid-January and Havre in mid-May. Approximately \$400,000 will be available for distribution at each hearing. Please plan on applying only one time during the grant period.
3. Limitations on funds necessitates a prioritized system for evaluation, therefore some good projects may not be funded. Some projects may be accepted during a later review if selected by the Council.

* If an original topographical map is used for mapping, smaller xerox copies may be used for the additional copies.

MONTANA NOXIOUS WEED GRANT PROGRAM
Format for Drafting a Project Proposal
(All Projects)

I. Description of the Project

- A. Project Title and Sponsor
- B. Overall Purpose of the Project
- C. Introduction (provide supporting background information if needed)
 - 1. History of the Problem
 - 2. Magnitude of the Problem

II. Statement of Need

- A. Why is the project important and what will happen if nothing is done?

III. Specific Objectives

- A. What are you going to do to meet the need outlined above?

IV. Methodology

- A. Plan of Work (Who will conduct the work and how will it be completed?)
 - 1. Mapping: if completed, include maps of the area to be treated; if part of the plan, indicate method you will be using
 - 2. Control measures: including methods of treatment, rates and timing of herbicides, grazing management plans, use of cultural, mechanical or biological control agents - address all environmental factors such as non-target species, waterways, groundwater, soil type, etc. (include completed form NW1003, Environmental Action Checklist).
 - 3. Education programs: outline how you will educate the public in your area about your project, including radio, TV, tours, demonstration areas, workshops on sprayer calibration, printed materials, etc.
 - 4. Data analysis: How will data collected be analyzed?
- B. Cooperative Agreements
 - 1. Include a statement outlining all cooperators and their commitment to the project.
- C. Evaluation
 - 1. How will you measure the success of the project?

V. Time Schedule

- A. Develop a complete time schedule for beginning and completing major phases of the project.
- B. In the case of cooperative weed management programs, outline a long-term commitment for management of the target weed species.

VI. Budget

- A. Financial Narrative
 - 1. Justify and explain all labor, travel, equipment, materials, educational material, support staff, etc.
 - 2. Show a projection of funds needed for each year and quarter. Quarters run from July 1 to September 30, October 1 to December 31, January 1 to March 31, and April 1 to June 30.
- B. Budget Detail
 - 1. Include a budget detail outlining requested funds and showing all matching funds and their sources (eg. - highway department, landowners, railroad, etc).

VII. Supporting Documents

- A. Subcontract Agreements
- B. Property Easements
- C. Signed Agreements from Cooperators
- D. Documents of Previous Work
- E. Maps

MONTANA NOXIOUS WEED GRANT PROGRAM APPLICATION

Applicant Name: _____
[Note: All correspondence will be addressed to this person.]

Address: _____

Telephone Number: Business _____ Home _____

If Applicable, County Sponsor(s): _____

County Weed District Budget \$ _____ (_____ mills = \$ _____)

PROJECT INFORMATION SUMMARY

Title: _____

Brief Project Description: _____

Project Type: _____ Local Coop _____ Non-Chemical _____ Other _____

Has work begun on the project? No _____ Yes _____
If yes, please describe what has been done and the source of funds: _____

Project Budget: To be funded for _____ years.

Total Grant Request \$ _____

Total Matching Funds \$ _____

Sources of Funds

Total Project Cost \$ _____

Signature & Title of Authorized Representative

Date

Department Head (if applicable)

Date

Form NW 1001 (6/90)

NOXIOUS WEED GRANT PROGRAM APPLICATION
Budget Detail

Title: _____

	Grant Funds	Matching Funds*	Total
Salaries			
Hourly Wages			
Benefits			
Total Personal Services			
Contracted Services			
Supplies & Materials			
Communications			
Travel			
Rent			
Repair & Maintenance			
Other Expenses (be specific in financial narrative)			
Equipment			
Total Operations			
Total Direct Costs			
Indirect Costs* *Not to exceed 10%			
Total			

		Year 1	Year 2	Year 3
Total grant funds	\$ _____	\$ _____	\$ _____	\$ _____
Total matching funds	\$ _____	\$ _____	\$ _____	\$ _____
TOTAL PROJECT COST	\$ _____	\$ _____	\$ _____	\$ _____

*List contributors to matching funds: _____

MONTANA NOXIOUS WEED GRANT PROGRAM APPLICATION
Environmental Action Checklist

Title: _____

Please note: Use the back of this form and additional paper as needed to explain how environmental impacts will be mitigated for all questions answered with a "yes" answer.

1. Significant use of the area by important wildlife and fish species. Yes _____ No _____
2. Important vegetation communities present which may be impacted by the proposed project. Yes _____ No _____
3. Significant topographic features, terrain, or aesthetic values are present. Yes _____ No _____
4. Important surface or groundwater resources are present which may be impacted by the proposed project. Yes _____ No _____
5. Fragile soils or soils requiring special consideration are present. Yes _____ No _____
6. Land has been included as a part of a baseline study or any other type of report (such as Natural Area Program, rights-of-way, easements, leases, etc.) Yes _____ No _____
7. Previously permitted or leased activities on this area resulted in special protective stipulations. Yes _____ No _____
8. Present land management is influenced significantly by adjacent state, federal, or private land management practices. Yes _____ No _____
9. Project area contains areas with unique or special reclamation considerations (past mining, erosion, saline seep, etc.). Yes _____ No _____
10. Additional Comments: _____

Prepared By _____

Date _____

NOXIOUS WEED TRUST - PROJECT RANKING WORKSHEET

Project No. _____ Type: _____

RANKING CRITERIA (4.5.108)		Y	N	COMMENTS
1.	Weed district proposal			
2.	Community group proposal			
3.	Statewide utilization with tangible results			
4.	Educational program to increase weed awareness and improve control techniques			
5.	Includes integrated weed management techniques (biological, cultural, chemical)			
6.	Enhancement of renewable resources			
7.	Matching funds provided by project sponsor			
8.	Project not previously funded			
9.	Results will provide public benefits			
10.	Long-term effect on natural resources			
11.	Noxious weed emergency involved with tangible results			

Limited weed district funding sources YES NO
 County Mill Levy: _____ \$ _____

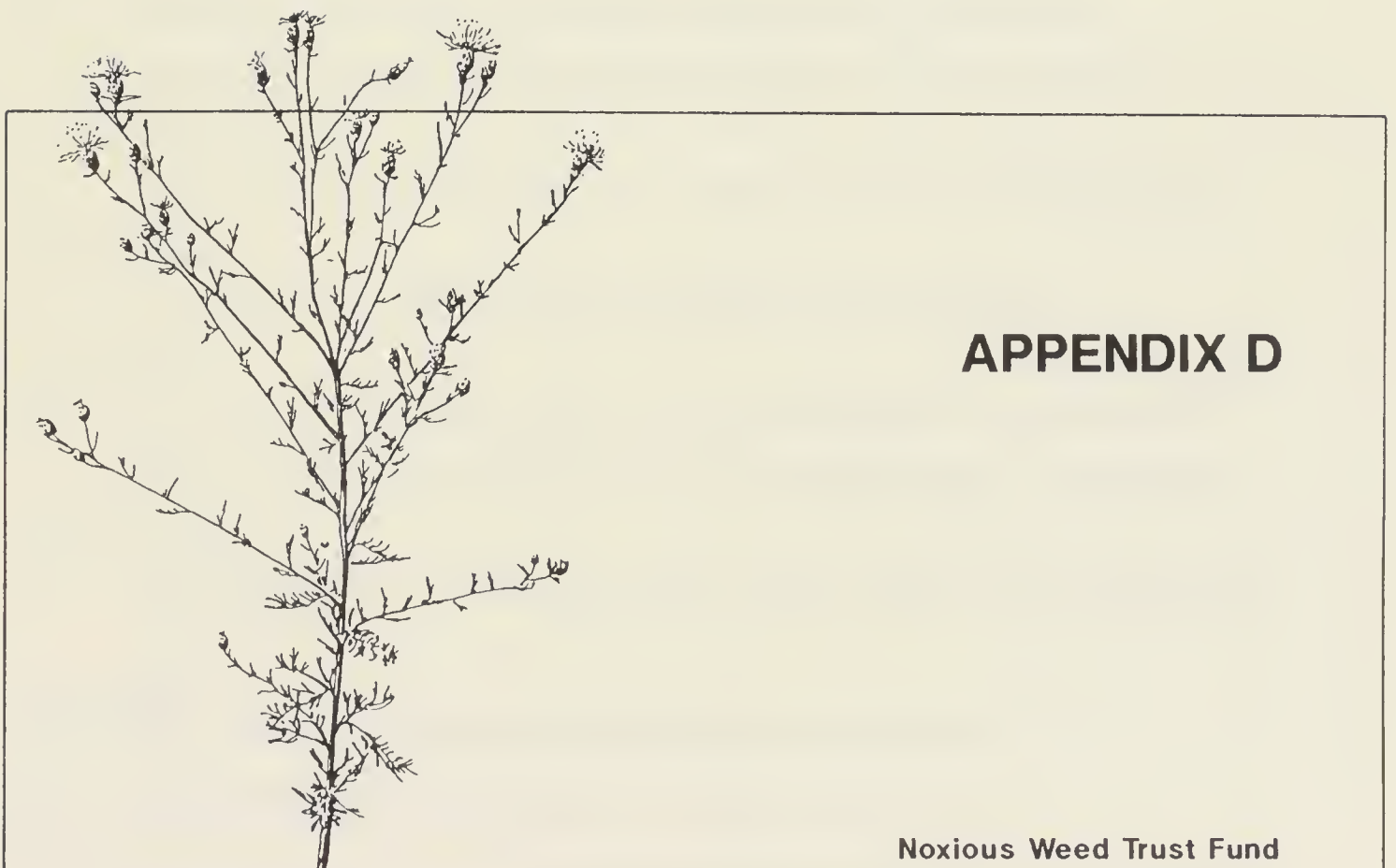
Requested funding: \$ _____
 Recommended funding: \$ _____
 Final funding: #Y _____ #N _____

Overall quality of proposal: _____

Additional Comments: _____

Continuation Project Y N Number of previous years funding: _____

Montana NWTF Summary Report and 1991 Update



APPENDIX D

**Noxious Weed Trust Fund
Programmatic Environmental Impact Statement**

APPENDIX D

MONTANA NOXIOUS WEED TRUST FUND

1991 UPDATE

- Projects funded through May, 1991. A total of 80 projects have been funded to date, spending \$1,190,862.

LOCAL COOPERATIVE WEED PROGRAMS

Big Horn County

- Crow Noxious Weed Control Project; Big Horn County Weed District, 1 year, \$15,000.00.
- Big Horn County Sulfur Cinquefoil Control Project; Big Horn County Weed District, 1 year, \$10,000.00.

Carbon County

- Cooney-Roscoe Weed Control Program; Carbon County Weed District, 3 years, \$40,000.00.

Carter County

- Whitetop Control Program; Carter County Weed District, 1 year, \$3,793.00.
- Cottonwood/Hackberry Leafy Spurge Sheep Project; Carter County Weed District, 1 year, \$18,884.00.
- Capitol Area Leafy Spurge Project; Carter County Weed District, 3 years, \$53,992.00.

Gallatin County

- Son of Sixteen Mile; Gallatin County Weed District, 1 year, \$13,000.00.

Hill County

- Bonneau Russian Knapweed Project; Hill County Weed District, 3 years, \$4,050.00.
- Sage Creek Russian Knapweed Project; Hill County Weed District, 1 year, \$4,500.00.

Jefferson County

- Fish Creek East Coop Noxious Weed Control Project; Jefferson County Weed District, 1 year, \$6,500.00.

Lake County

- Elmo Weed Project; Lake County Weed District, 2 years, \$20,000.00.
- Vinson Ranch Project; Lake County Weed District, 2 years, \$4,00.00.

Lewis and Clark County

- Birdseye Weed Management Area; Lewis & Clark County Weed District, 3 years, \$20,235.00.
- McDonald Pass Weed Management Area; Lewis & Clark County Weed District, 3 years, \$25,900.00.

Lincoln County

- Tobacco Valley Weed Management Program; Lincoln County Weed District, 1 year, \$8,000.00.

Meagher County

- Lower Smith River Weed Project; Meagher County Weed District, 1 year, \$9,265.00.
- Biocontrol of Leafy Spurge Using Flea Beetles; Meagher County Weed District, 1 year, \$5,000.00.

Missoula County

- Missoula County Group; Missoula County Weed District, 1 year, \$50,000 for all 5 projects (final allocation of funding to be determined by the Missoula County Weed Board).
 - ▶ Grant Creek Weed Control Project
 - ▶ Frenchtown Weed Management Area
 - ▶ Bitterroot Valley Weed Management Area
 - ▶ Upper Ninemile Weed Control District
 - ▶ Lower Ninemile Weed Management Area
- Double Arrow Ranch; Missoula County Weed District, 3 years, \$7,400.00.
- Grass Valley Noxious Weed Control Project; Missoula County Weed District, 1 year, \$5,000.00.

Park County

- Upper Yellowstone Valley Spotted Knapweed Management Area; Park County Weed District, 3 years, \$9,000.00.

Pondera County

- Upper Pondera Weed Control Project; Pondera County Weed District, 2 years, \$5,000.00.
- Sheep Creek Weed Project; Pondera County Weed District, 2 years, \$12,800.00.
- Dry Fork Weed Project; Pondera County Weed District, 3 years, \$7,703.00.
- Bullhead Weed Committee; Pondera County Weed District, 3 years, \$6,750.00.
- Lower Birch Creek Weed Project; Pondera County Weed District, 1 year, \$16,500.00.

Powell County

- Deer Lodge Cooperative Weed Project; Powell County Weed District, 2 years, \$18,500.00.

Sanders County

- Niarada Weed Control Project; Sanders County Weed District, 1 year, \$30,000.00.
- Dixon Weed Project; Sanders County Weed District, 2 years, \$20,000.00.

Wheatland County

- Little Elk/Miller Creek Weed Project; Wheatland County Weed District, 3 years, \$14,066.00.

Yellowstone County

- Razor Creek Cooperative; Yellowstone County Weed District, 1 year, \$10,000.00.

Multi County Projects

- Knapweed Project #3 - Southeast Montana; Carter, Garfield, Prairie, Rosebud, Treasure, Powder River, Fallon, and Custer County Weed Districts, 1 year, \$35,000.00.
- Lower Pondera Creek Weed Project; Pondera and Liberty County Weed Districts, 1 year, \$5,000.00.
- Rocky Mountain Front Weed Project; Lewis & Clark and Teton County Weed Districts, 1 year, \$10,000.00.
- Southwest Montana Coordinated Weed Projects (26 projects); Silver Bow, Madison, Granite, Powell, Beaverhead, and Deer Lodge County Weed Districts, 1 year, \$250,000.00.
- Tri-County Leafy Spurge Project; Fallon, Wibaux, and Prairie County Weed Districts, 1 year, \$16,944.00.

RESEARCH PROJECTS

- A Grazing Model for Weed Control; Big Horn County Weed District, 3 years, \$12,000.00.
- Crazy Mountain Spurge Project; Park County Weed District, 1 year, \$6,248.00.
- Biocontrol of Spotted Knapweed with Sheep; Gallatin County Weed District, 3 years, \$25,000.00.
- Sulfur Cinquefoil; University of Montana, 2 years, \$19,957.00.
- Foreign Screening of Insects for Spotted Knapweed; Western Ag Research Center, 1 year, \$48,800.00.
- Foreign Collection of Insects for Spotted Knapweed; Western Ag Research Center, 1 year, \$56,000.00.
- Biocontrol of Leafy Spurge; Montana State University, 1 year, \$50,000.00.
- Biocontrol of Dalmatian Toadflax; Montana State University, 1 year, \$50,000.00.
- Host Specificity of Leafy Spurge Insects; Montana State University, 1 year, \$4,655.00.

- Defoliating Moth on Dalmatian Toadflax; Montana State University, 2 years, \$8,000.00.
- NE Montana Biocontrol Project for Canada Thistle & Leafy Spurge Phases II & III; Richland County Weed District, 1 year, \$22,500.00.

EDUCATIONAL PROJECTS

- 1991 Montana Weed Fair; Big Horn County Weed District, 1 year, \$2,000.00.
- Montana Noxious Weed Seed Free Hay, Phase II; Lewis & Clark and Gallatin County Weed Districts, 2 years, \$40,000.00.
- Dyers Woad Eradication Program in Montana; Montana State University in cooperation with Gallatin, Beaverhead, Missoula, Park, and Pondera County Weed Districts, 1 year, \$32,000.00.
- Interactive Education Program for Small Grain Producers; Montana State University, 1 year, \$27,920.00.

**MONTANA NOXIOUS WEED TRUST FUND
SUMMARY REPORT**

DECEMBER 1990

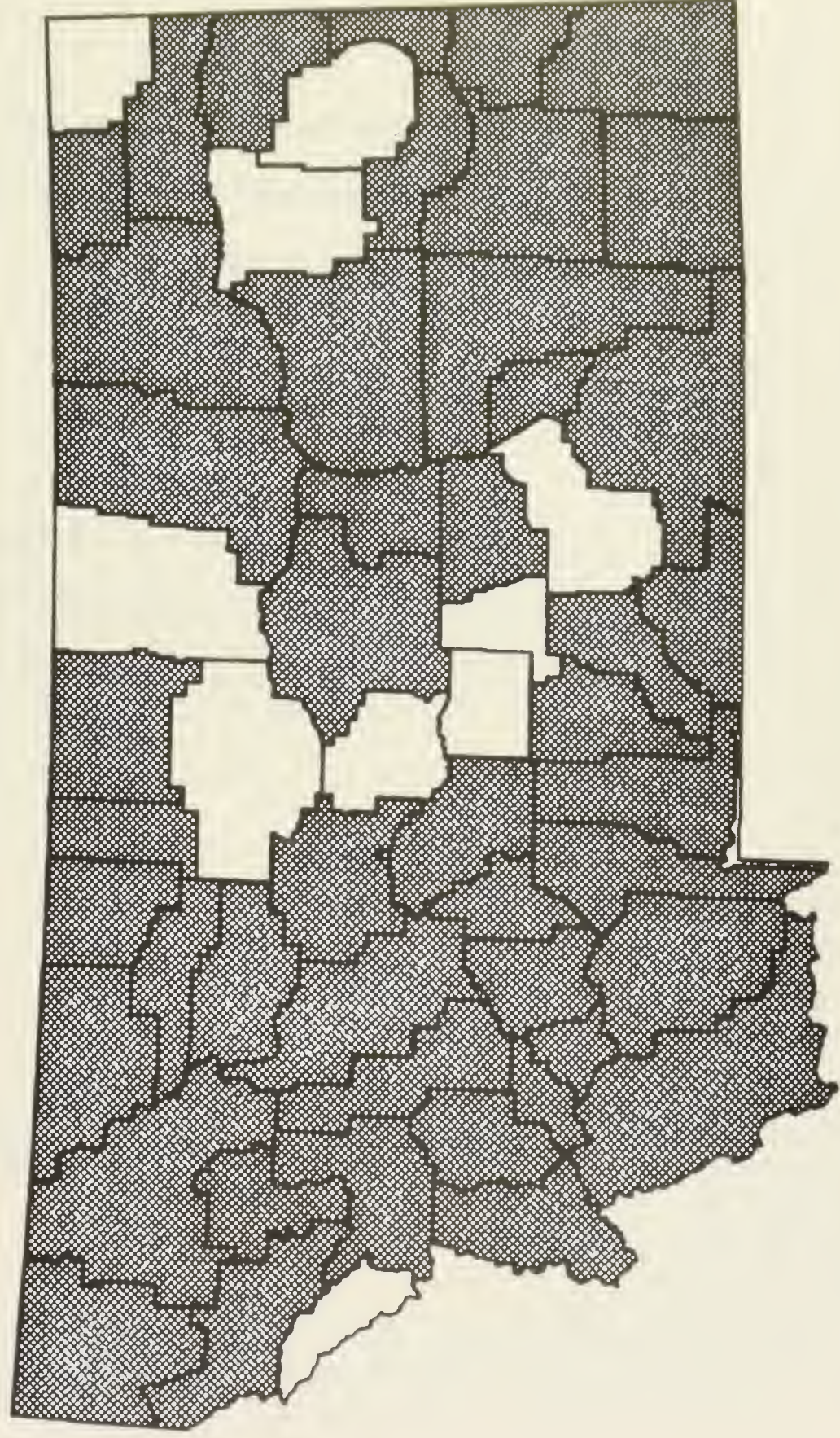


MONTANA DEPARTMENT OF AGRICULTURE

MONTANA NOXIOUS WEED TRUST FUND PROJECTS

CUMULATIVE FUNDING

1985 - 1990



 Counties Funded

THE MONTANA NOXIOUS WEED TRUST FUND PROGRAM

MONTANA DEPARTMENT OF AGRICULTURE

DECEMBER, 1990

Introduction	1
Financial Summary	3
Grant Summary	8

**Questions may be addressed to the
Environmental Management Division, Noxious Weed Section,
Capitol Station, Helena, Montana (406) 444-2944.**

MONTANA NOXIOUS WEED TRUST FUND PROGRAM

**Barbra Mullin, Weed Coordinator
Montana Department of Agriculture
Helena, Montana
December, 1990**

Introduction

The Montana Noxious Weed Trust Fund grants program is a creative program designed to assist individuals, counties, local weed control groups, researchers and educators in their efforts to solve a variety of weed problems in Montana. The program is administered by the Montana Department of Agriculture, Environmental Management Division.

Created by the 1985 legislature to establish a grants program and permanent trust, the program helps to fund local cooperative weed management projects that need seed money to get a good control effort established. The revenue has also been used to fund educational efforts on noxious weed management, biological weed control research, and other creative programs.

Support of community weed control efforts is a vital part of the Trust Fund program - over 60% of the total amount granted has gone to local cooperative project areas across the state. Thirty per cent of the money has gone to support screening and development of biological and nonchemical control agents to aid in the battle against noxious weeds. The remaining funds have helped support additional educational projects that we expect to benefit Montana statewide.

Funding

Funding for the program comes from a variety of sources. The original funding was from a \$1 million, one-time grant from the Resource Indemnity Trust Fund (RIT). Continuation funding has been provided through a 1% herbicide surcharge, paid by companies registering and selling herbicides in Montana, and by a vehicle weed fee paid by all Montana vehicle owners. For the last two legislative sessions the program has received additional funds for the biocontrol effort from special oil overcharge monies (stripper well funds) paid to the state from major U.S. oil companies.

Permanent Trust

A special Trust account was established with half of the RIT grant and is added to yearly from half of the herbicide surcharge and interest from all revenue sources. After the Trust reaches its \$2.5 million goal, all interest generated will be used for the grant program.

The permanent Trust Fund account, as of fiscal year end 1990, stood at \$1,677,332. Based on projected revenues and interest, the principal should reach the \$2.5 million goal by June 30, 1993.

Benefits to Counties

Noxious weeds threaten the state as a whole. The State Noxious Weed Trust Fund grants program allows for the development and implementation of a statewide plan to contain weeds where they are most serious and to help prevent establishment in new areas. Often we have seen an increase in funding from state and federal land management agencies in areas where there are local cooperative weed projects effectively operating.

The Trust Fund allows for funding of extremely innovative research, such as that supporting the biological control research effort in the state. A statewide program is better able to identify new threats to the state and provide immediate funding for containment, such as the yellow starthistle threat from Idaho and purple loosestrife, a serious wetland threat. A small part of the grants program each year goes to educational efforts that are designed to help all local weed districts and extension offices.

Laws & Regulations

The Noxious Weed Trust Fund grants program operates under state statute and rules, Title 80-7-801 through 821, MCA 1985 and 4.5.101 through 4.5.112 A.R.M.

Noxious Weed Management Advisory Council

The Noxious Weed Management Advisory Council is appointed by the Director of the Montana Department of Agriculture and approved by the Governor. Current Council members are:

Everett Snortland, Director, Montana Department of
Agriculture, Chairman
Joe Boyd, Consumer Group
Dane Castleberry, Livestock Production
Candace Durran, Sportsman/Wildlife Group
Lonnie McCurdie, At-large Member
Wayne Pearson, Montana Weed Control Association
Donna Pratt, Agriculture Crop Production
Robert Thoft, Biological Research & Control
Tom Wood, Herbicide Dealer/Applicator

**FINANCIAL SUMMARY REPORT FOR THE
MONTANA NOXIOUS WEED TRUST FUND GRANTS PROGRAM
1985 through 1990**

Fiscal Year 1986

Grants funded by the original Resource Indemnity Trust (RIT) grant and collection of the first 1% herbicide surcharge funds. No grants were funded from the collected herbicide surcharge until FY'87. The figures below reflect revenue collected and accounts receivable as well as expenditures incurred during the fiscal year. The Noxious Weed Act became effective April 19, 1985, therefore the fees collected from the surcharge involved only a portion of the calendar year.

	REVENUES		EXPENDITURES
Herbicide Surcharge	\$ 40,386.54	Herbicide Surcharge	
		Grants (see explanation above)	
		Administration*	\$ <u>8,068.54</u>
TOTAL	\$ 40,386.54	TOTAL	\$ 8,068.54
RIT Weed Funds	\$ 260,570.50	RIT Grant	
		Grants	\$ 246,703.44
		Administration	\$ <u>2,500.00</u>
TOTAL	\$ 260,570.50	TOTAL	\$ 249,203.44
GRAND TOTAL	\$ 300,957.04		\$ 257,271.98

[Weed Coordinator budget of \$27,298.08 funded from General Fund.]

* Administrative costs from herbicide surcharge revenues supports the Noxious Weed Advisory Council and a .25 FTE for collection of the surcharge.

Fiscal Year 1987

Grants funded by the original RIT grant and herbicide surcharge collections from FY'86 & '87.

	REVENUES		EXPENDITURES
Herbicide Surcharge	\$ 183,442.85	Herbicide Surcharge	
		Grants	\$ 213,056.00
		Administration*	\$ <u>11,498.77</u>
TOTAL	\$ 183,442.85	TOTAL	\$ 224,554.77**
RIT Weed Funds	\$ 239,429.50	RIT Grant	
		Grants	\$ 247,499.99
		Administration	\$ <u>2,500.00</u>
TOTAL	\$ 239,429.50	TOTAL	\$ 249,999.99**
GRAND TOTAL	\$ 422,872.35		\$ 474,554.76**

[Weed Coordinator budget of \$34,027.99 funded from General Fund.]

* See FY86

** Unobligated balances from previous fiscal year remain in account and are carried forward or used in subsequent years within legislative authorization.

Fiscal Year 1988

Grants funded by the herbicide surcharge collections from FY'88; first year for collection of vehicle weed fee of \$.50 per vehicle; and special biennium appropriation from oil overcharge (stripper well) grant. The RIT Weed Grant funds were completely expended in fiscal years 1986 and 1987.

	REVENUES		EXPENDITURES
Herbicide Surcharge	\$ 187,006.40	Herbicide Surcharge	
		Grants	\$ 111,776.00
		Administration*	<u>\$ 10,150.76</u>
TOTAL	\$ 187,006.40	TOTAL	\$ 121,926.76**
Vehicle Weed Fee	\$ 334,867.17	Vehicle Weed Fee	
		Grants	\$ 371,324.00
		Administration	<u>\$ -0-</u>
TOTAL	\$ 334,867.17	TOTAL	\$ 371,324.00**
Oil Overcharge	\$ 15,783.87	Oil Overcharge	
		Grants	<u>\$ 15,783.87</u>
TOTAL	\$ 15,783.87	TOTAL	\$ 15,783.87
GRAND TOTAL	\$ 537,657.44		\$ 509,034.63

[Weed Coordinator budget of \$37,671.40 funded from General Fund.]

* See FY86, ** See FY87

Fiscal Year 1989

Grants funded by the herbicide surcharge collections from FY'89, vehicle weed fee from FY'89 and biennium oil overcharge continuing appropriation.

	REVENUES		EXPENDITURES
Herbicide Surcharge	\$ 144,752.13	Herbicide Surcharge	
		Grants	\$ 132,558.98
		Administration*	<u>\$ 10,686.35</u>
TOTAL	\$ 144,752.13	TOTAL	\$ 143,245.33
Vehicle Weed Fee	\$ 381,696.05	Vehicle Weed Fee	
		Grants	\$ 348,595.00
		Administration	<u>\$ -0-</u>
TOTAL	\$ 381,696.05	TOTAL	\$ 348,595.00
Oil Overcharge	\$ 84,216.13	Oil Overcharge	
	(continuing appropriation)	Grants	\$ 84,216.13
TOTAL	\$ 84,216.13	TOTAL	\$ 84,216.13
GRAND TOTAL	\$ 610,664.31		\$ 576,056.46

(Weed Coordinator budget of \$38,191.71 funded from General Fund.)

* See FY86

Fiscal Year 1990

Grants funded by the herbicide surcharge collections from FY'90, vehicle weed fee from FY'90 with increase to \$1.50 and biennium oil overcharge appropriation. First year for additional administrative costs of weed coordinator program from special revenues rather than general fund. A detailed budget is outlined below for those interested in how the program is currently administered.

	REVENUES	EXPENDITURES
Herbicide Surcharge	\$ 183,877.70	Herbicide Surcharge
		Grants \$ 170,005.00
		Administration* \$ <u>10,722.10</u>
TOTAL	\$ 183,877.70	TOTAL \$ 180,727.10
Vehicle Weed Fee	\$1,111,743.43	Vehicle Weed Fee
		Grants \$ 918,045.00
		Administration*** \$ <u>87,028.34</u>
TOTAL	\$1,111,743.43	TOTAL \$1,005,073.34
Oil Overcharge	\$ 150,000.00	Oil Overcharge
	(continuing	Grants \$ 150,000.00
	approp to '91)	
TOTAL	\$ 150,000.00	TOTAL \$ 150,000.00
GRAND TOTAL	\$1,445,621.13	\$1,335,800.44

* See FY86

*** Administrative costs from vehicle weed revenues supports the weed coordinator, program assistant, program operations and indirect costs legislatively mandated.

FISCAL YEAR 1990 - DETAILED BUDGET

Vehicle Weed Fee Revenues and Expenditures

The 1989 Legislature authorized a yearly vehicle weed budget of \$1,144,494 for grants and administration. The actual collection for FY'90 was \$1,111,743. The Department is obligated not to exceed spending beyond the actual revenues available. Please note that individual counties can retain 3% of the vehicle weed revenues generated for local administrative costs and this amount is not included in the Department's revenues.

The Department allocated the FY'90 vehicle weed revenues in the following manner:

Indirect costs for MDA Central Management		
Division (as required by Legislature)		\$ 33,000
Noxious Weed Program		\$ 972,073
Weed Coordinator & Operation (1 FTE)	(\$ 41,258)	
Assistant (.67 FTE)	(\$ 12,770)	
Grants	(\$ 918,045)	
Balance		\$ <u>106,670</u>
	TOTAL	\$1,111,743

Total revenues for the noxious weed program from the vehicle weed fee were \$1,078,743 (excluding indirect costs of \$33,000).

Total expenditures for the vehicle weed grants were \$918,045 (85.1% of the total revenues) and total administrative costs were \$54,028 (5.0% of the total revenues). The balance of \$106,670 (9.9%) is available for grants in FY'91, but expenditures of this balance must be within legislative authorization for FY'91.

The types of grants funded with vehicle weed revenues include:

- Local cooperative weed control projects	\$ 501,581 (54.6%)
- Educational weed projects	\$ 116,530 (12.7%)
- *Non-chemical research projects	\$ 220,220 (24.0%)
- *County biocontrol projects	\$ 55,714 (6.1%)
- Chemical research projects	\$ 24,000 (2.6%)
Total	\$ 918,045 (100%)

* Total expenditures for non-chemical research and demonstration were \$275,934 (30.1%). A minimum of 25% is mandated under 80-7-810, MCA.

Herbicide Surcharge Revenues and Expenditures

The surcharge on retail sales of herbicides is outlined in 80-7-812, MCA. The revenues from the herbicide surcharge are allocated in the following manner:

- one-half of the revenues must be deposited in the permanent Noxious Weed Trust Fund account (80-7-811 and 80-7-814, MCA); and
- one-half of the revenues are available for grants and administration.

The 1989 Legislature authorized a yearly surcharge budget of \$400,000 for the '90-'91 biennium, one-half for the permanent Trust account and one-half for grants and administration. The actual collection for FY'90 was \$367,755, with \$183,877.50 for deposit in the Trust and a like amount available for grants and administration. While the Department authorization for the grants and administration was \$200,000, we are obligated to not exceed spending beyond the \$183,877.50 actually available.

The actual FY'90 expenses for the herbicide surcharge revenues were:

Montana Noxious Weed Advisory Council (mandated by law)	\$ 6,700 (3.6%)
.25 FTE temporary clerk and operations (for collection of the surcharge revenues)	\$ 4,021 (2.2%)
Grants	\$ 170,005 (92.4%)
Balance	\$ 3,151 (1.8%)
Total	\$ 183,877 (100%)

The types of grants funded with herbicide surcharge revenues include:

- Local cooperative weed control projects	\$ 163,705 (96.3%)
- Educational weed projects	6,300 (3.7%)
Total	\$ 170,005 (100%)

Oil Overcharge Funds

The Department also received \$150,000 of the oil overcharge (stripper well) funds this biennium. These funds must be used for biological control projects on leafy spurge and spotted knapweed.

Total Noxious Weed Grants Program

The total program revenues for FY'90 were \$1,445,621. Total program expenditures were \$1,278,578. Total grants were \$1,180,828 (82% of the total revenues), administrative costs were \$64,750 for the Advisory Council and support services (4% of the total revenues) and \$33,000 for indirect costs (2% of the total revenues), leaving a balance in the total program of \$160,043 (12% of the total revenues).

Future Requests and Program Plans

The FY'91 budget is nearly identical to the FY'90 budget outlined above. The Department anticipates that expenditures for FY'91 will also be similar. The Department's proposed biennium budget (FY'92-93) for legislative consideration reflects similar projected revenues and expenditures for grants and administration.

The Department is required to prepare a programmatic environmental impact statement (PEIS) for the noxious weed grant program to meet the requirements of the Montana Environmental Policy Act. The PEIS will be developed and finalized in FY'91 and FY'92 under contract to a private consultant firm. The cost of this project will be approximately \$126,000. The Department has an approved budget amendment for this project.

**GRANTS SUMMARY REPORT FOR THE
MONTANA NOXIOUS WEED TRUST FUND GRANTS PROGRAM
1985 through 1990**

Grants are listed by title, agency sponsoring the grant, length of the funding and the amount the project was awarded. In some cases not all the funds were used. In those cases, the returned funds may be reallocated (as legislative authority allows) to another grant or deposited in the permanent Trust account.

Grants are also listed by type. Local cooperative weed programs generally involve on-the-ground cost share programs with local landowners. Research programs may be sponsored by the university system or local agencies. Educational programs are sponsored by a number of groups and generally have statewide benefits. *Indicates non-chemical projects. + Indicates ongoing projects.

1985

- Projects funded with original RIT appropriation through a grant from DNRC (Included in FY'86) Note: Projects funded for longer than one year had some funds from the herbicide surcharge.

Local Cooperative Weed Programs

Fallon County

- Cottonwood Knapweed Project, Little Beaver Conservation District, Fallon County Weed District, 2 years, \$14,789
- Dugout Creek Leafy Spurge Control Project, Little Beaver Conservation District, Fallon County Weed District, 2 years, \$8,357

Roosevelt County

- Coordinated Leafy Spurge Control Project, Roosevelt County Weed District, 3 years, \$48,088

Multi-County Projects

- Southwest Montana Cooperative Noxious Weed Control, 3 years, \$231,256; Silver Bow County Weed District, \$66,500; Granite County Weed District, \$53,201; Madison County Weed District, \$81,506; Jefferson County Weed District, \$30,059 +
- Marias River Basin Weed Control, Liberty, Toole, Glacier and Pondera County Weed Districts, 2 years, \$62,000

Research Projects

- Biological Control of Noxious Weeds Using A Fungus*, Missoula County Conservation District, 2 years, \$90,700

Educational Programs

- A Program to Eradicate Dyer’s Woad, Montana State University, 2 years, \$32,856
- Demonstration of the Savory Grazing Management System for Weed Control*, Bitterroot Conservation District (Ravalli County), 5 years, \$6,000 +
- Noxious Weed Inventory and Mapping, Lewis & Clark County Conservation District, 2 years, \$12,000

1986

- Carry-over RIT projects and funding from herbicide surcharge

Local Cooperative Weed Programs

Park County

- Knapweed Control District, Park County Weed District, 2 years, \$10,000
- Rock Creek Leafy Spurge Project, Park County Weed District, 2 years, \$9,000

Powell County

- Coordinated Weed Project, Powell County Weed District, 2 years, \$45,000

Stillwater County

- Noxious Weed Management Program, Stillwater County Weed District, \$1,600

Research Projects

- Leafy Spurge Biological Control with Sheep*, Stillwater County Weed District, 2 years, \$5,000
- Stimulating Uncontrolled Root Bud Growth in Leafy Spurge, Montana State University, 3 years, \$17,000 (project terminated; researcher left the state)
- Biocontrol of Leafy Spurge*, Montana State University, 3 years, \$7,000
- Foreign Collection of Two Insects for Biocontrol of Spotted Knapweed*, Western Ag Research Center (MSU), 2 years, \$12,000
- Foreign Screening of Two Insects for Biocontrol of Spotted Knapweed*, Western Ag Research Center (MSU), 1 year, \$20,000

Educational Programs

- Knapweed Coupon Cooperative, Gallatin County Weed District, 1 year, \$7,700 (project terminated)
- Weed Mapping & Education, Meagher County Weed District , 2 years, \$7,500

- Pesticide Collection & Recycling, Teton County Weed District, 1 year, \$1,000

1987

- Projects funded from herbicide surcharge revenues

Local Cooperative Weed Control Projects

Broadwater County

- Winston Leafy Spurge Control Program, Broadwater County Weed District, 2 years, \$2,000

Carbon County

- Bluewater Creek Leafy Spurge Program, Carbon County Weed District, 2 years, \$12,000

Hill County

- Russian Knapweed Control Project, Hill County Weed District, 2 years, \$2,000

Lake County

- Irvine Flats Weed Control Project, Lake County Weed District, 2 years, \$10,000

Lewis & Clark County

- Canyon Creek War on Weeds, Lewis & Clark Weed District, 2 years, \$3,000

Park County

- Rock Creek Leafy Spurge, Park County Weed District, 1 year, \$4,500

Petroleum County

- Flatwillow Creek Leafy Spurge Program, Petroleum County Weed District, 2 years, \$8,000

Roosevelt County

- Coordinated Leafy Spurge Program, Roosevelt County Weed District, 1 year, \$10,000

Sweet Grass County

- Springdale Knapweed Control Program, Sweet Grass County Weed District, 2 years, \$10,500

Multi-County Projects

- Sixteen Mile Knapweed Weed Project, Gallatin & Meagher County Weed Districts, 2 years, \$4,000
- Southwest Montana Cooperative Noxious Weed Control, Butte/Silver Bow, Granite, Madison, and Jefferson County Weed Districts, 1 year, \$68,813

Research Projects

- Survey of Weeds in Conservation Tilled Fields, Montana State University, 1 year, \$7,000

- Foreign Screening and Collection of Insects for Spotted Knapweed*, Western Montana Ag Research Center, 1 year, \$20,000
- Influence of Spotted Knapweed on Run-Off, Montana State University, 1 year, \$1,300

Educational Programs

- 1987 State Weed Fair - Flathead County Weed District, 1 year, \$2,000
- Montana Weed Video, Montana Weed Control Association, 1 year, \$1,400
- Cooperative Weed Coordinator Position, Bureau of Land Management, 2 years, \$6,000

1988

- Projects funded by herbicide surcharge collection and \$.50 per vehicle weed fee

Local Cooperative Weed Programs

Carbon County

- Rock Creek Knapweed Control Project, Carbon County Weed District, 1 year, \$19,000

Carter County

- Whitetop Weed Project Area, Carter County Weed District, 2 years, \$10,000

Daniels County

- Daniels County Knapweed Project, Daniels County Weed District, 3 years, \$15,000 +

Deer Lodge County

- Anaconda-Deer Lodge Weed Control Project (SW), Deer Lodge County, 1 year, \$23,845

Fergus County

- Management of Spotted Knapweed, Fergus County Weed District, 2 years, \$10,000 +

Granite County

- Bearmouth Weed District (SW), Granite County Weed District, 1 year, \$28,082
- Douglas-Barnes Creek Weed Control District (SW), Granite County Weed District, 1 year, \$24,762
- North Cow Creek Weed District (SW), Granite County Weed District, 1 year, \$16,377
- Poison Patch Weed District (SW), Granite County Weed District, 1 year, \$21,701

Hill County

- Sage Creek Noxious Weed Project, Hill County Weed District, 1 year, \$7,000

Lake County

- Irvine Flats Weed Control Project, Lake County Conservation District, 1 year, \$14,000

Madison County

- Alder Weed Control Project (SW), Madison County Weed District, 1 year, \$5,800
- Pony-Harrison Knapweed Project (SW), Madison County Weed District, 1 year, \$1,043

Meagher County

- South Fork Weed Management Area, Meagher County Weed District, 1 year, \$10,000

Park County

- Knapweed Control District, Park County Weed District, 1 year, \$10,000
- Mill Creek Emigrant Knapweed Program, Park County Weed District, 1 year, \$10,000

Powell County

- Powell County Coordinated Weed Control Project (SW), Powell County Weed District, 1 year, \$38,698

Sanders County

- Big Bend Weed Control Project, Sanders County Weed District, 1 year, \$10,000

Silver Bow County

- Browns Gulch Weed Control Project (SW), Butte/Silver Bow Weed District, 2 years, \$16,430
- Little Basin Weed Project (SW), Butte/Silver Bow Weed District, 1 year, \$17,072
- Northside Urban Weed Control District, Butte/Silver Bow Weed District, 1 year, \$10,000

Sweet Grass County

- Springdale Knapweed Project Area, Sweet Grass County Weed District, 1 year, \$10,000

Valley County

- North Valley Cooperative Project Area*, Valley County Weed District, 1 year, \$10,000

Multi-County Projects

- Marias River Basin Weed Control Project, Glacier, Liberty, Pondera, and Toole County Weed Districts, 1 year, \$20,000

Research Projects

- Using Angora Goats for Leafy Spurge Control*, Richland/Roosevelt County Weed Districts, 2 years, \$18,000 (returned money to program after successful completion of the project)
- Biological Control of Noxious Weeds Using A Fungus*, Missoula County Conservation District, 1 year, \$17,000

- Potential of Tansy Mustard to Cause Photosensitization in Cattle, Montana State University, 2 years, \$5,665
- Control of Spotted Knapweed Using Livestock - Defoliation, Competition and Shading Effects*, Missoula County Conservation District, 1 year, \$27,802
- Control & Management of Weeds in CRP - Technical Bulletin Development and Wiper Application Success, Montana Grain Growers Association, 2 years, \$27,802
- Survey of Weeds in Conservation Tilled Fields, Montana State University, 1 year, \$9,666
- Screening of Natural Enemies for Leafy Spurge Control*, Montana State University, 1 year, \$22,500
- Screening & Collection of Natural Enemies for Dalmatian Toadflax Control*, Montana State University, 1 year, \$30,000
- Foreign Collection of Two Insects for the Control of Spotted Knapweed*, Western Montana Research Center (MSU), 1 year, \$16,240
- Screening of a Seed Head Weevil for Spotted Knapweed Control*, Western Montana Research Center (MSU), 1 year, \$37,000
- Foreign Host-Specificity Testing for Spotted Knapweed Insects*, Western Montana Research Center (MSU), 1 year, \$45,238

Educational Programs

- Spotted Knapweed Awareness Pamphlet, Liberty County Weed District, 1 year, \$3,000
- 1988 Montana Weed Fair, Butte/Silver Bow Weed District, 1 year, \$2,000
- Resource Education Awareness Weed Project, Missoula County Conservation District, 1 year, \$7,000
- Weed District Training to Reduce Water Contamination, University of Montana, 1 year, \$4,500

1989

- Projects funded from herbicide surcharge and \$.50 per vehicle weed fee

Local Cooperative Weed Programs

Beaverhead County

- Wise River Weed Project (SW), Beaverhead County Weed District, 1 year, \$4,400

Broadwater County

- Kimber Gulch-Indian Creek Weed Project, Broadwater County Weed District, 1 year, \$5,000

Carbon County

- Bluewater Creek Leafy Spurge Project, Carbon County Weed District, 1 year, \$5,000
- Middle Rock Creek Knapweed Control Project, Carbon County Weed District, 1 year, \$10,000
- Rock Creek Knapweed Control Project, Carbon County Weed District, 1 year, \$10,000

Cascade County

- Little Belt Creek Drainage Noxious Weed Control Program, Cascade County Weed District, 1 year, \$6,000

Deer Lodge County

- Anaconda-Deer Lodge Coordinated Weed Project (SW), Deer Lodge County Weed District, 1 year, \$13,600

Gallatin County

- Grandview Heights Leafy Spurge Project, Gallatin County Weed District, 1 year, \$2,000

Granite County

- Douglas-Barnes Creek Weed District (SW), Granite County Weed District, 1 year, \$18,300
- Maxville Weed District (SW), Granite County Weed District, 1 year, \$1,900
- North Cow Creek Weed District (SW), Granite County Weed District, 1 year, \$6,000
- Poison Patch Weed District (SW), Granite County Weed District, 1 year, \$8,200
- Rattler Weed District (SW), Granite County Weed District, 1 year, \$10,700
- Skalkaho Weed Control District (SW), Granite County Weed District, 1 year, \$2,700
- Trout Creek Weed Control District (SW), Granite County Weed District, 1 year, \$2,500

Lake County

- Irvine Flats Weed Control Project, lake County Conservation District, 1 year, \$15,000
- Purple Loosestrife Management Zone, Lake County Weed District, 1 year, \$4,000

Lewis & Clark County

- East Helena Diffuse Knapweed Management Project, Lewis & Clark County Weed District, 1 year, \$10,000

Liberty County

- Lower Pondera Creek Weed Project, Liberty County Weed District, 1 year, \$5,000

Lincoln County

- Tobacco Valley Weed Management Program, Lincoln County Weed District, 1 year, \$10,000 +

Madison County

- Alder Control Unit (SW), Madison County Weed District, 1 year, \$2,400
- Harrison Control Unit (SW), Madison County Weed District, 1 year, \$1,700
- McCartney Mountain Control Unit (SW), Madison County Weed District, 1 year, \$2,000
- South Boulder Coop Area (SW), Madison County Weed District, 1 year, \$900
- Waterloo Spurge-Knapweed Control Unit (SW), Madison County Weed District, 1 year, \$2,400

Missoula County

- Bitterroot Valley Weed Management Area, Missoula County Conservation District, 1 year, \$12,500

Park County

- Rock Creek Leafy Spurge District, Park County Weed District, 1 year, \$10,000

Pondera County

- Dry Fork Weed Committee, Pondera County Weed District, 1 year, \$4,000

Powell County

- East Deer Lodge Valley Weed District (SW), Powell County Weed District, 1 year, \$900
- Gold Creek Weed Project (SW), Powell County Weed District, 1 year, \$4,200
- Helmville Valley Weed Project (SW), Powell County Weed District, 1 year, \$4,200
- Ovando Addition Weed Project (SW), Powell County Weed District, 1 year, \$2,300

Rosebud County

- Colstrip Cooperative Weed Management Area, Rosebud County Weed District, 1 year, \$2,000

Sanders County

- Big Bend Weed Project, Sanders County Weed District, 1 year, \$10,000
- Markle Hill Weed Project, Sanders County Weed District, 1 year, \$6,000

Silver Bow County

- Butte Urban Weed Project, Butte/Silver Bow Weed District, 1 year, \$10,000

- Fairmont Weed Project Area (SW), Butte/Silver Bow Weed District, 1 year, \$8,200
- German Gulch Weed Project Area (SW), Butte/Silver Bow Weed District, 1 year, \$8,200

Sweet Grass County

- Springdale Knapweed Control Project, Sweet Grass County Weed District, 1 year, \$10,000

Valley County

- North Valley Cooperative Weed Control*, Valley County Weed District, 1 year, \$8,000

Multi-County Projects

- Knapweed Project - Southeastern Montana, Carter, Custer, Fallon, Garfield, Prairie, Powder River, Rosebud, and Treasure County Weed Districts and Extension Services, 1 year, \$20,000
- Marias River Weed Committee, Toole and Pondera County Weed Districts, 1 year, \$5,000
- Rocky Mountain Front Weed District, Lewis & Clark and Teton County Weed Districts, 1 year, \$10,000

Research Projects

- Screening of Insects for Spotted Knapweed Biocontrol*, Western Montana Research Center (MSU), 1 year, \$33,375
- Screening of *Larinus obtusus* for Spotted Knapweed Control*, Western Montana Research Center (MSU), 1 year, \$22,500
- Collection of Insects for Spotted Knapweed Biocontrol*, Western Montana Research Center (MSU), 1 year, \$14,620
- Collection & Screening Insects for Biocontrol of Dalmatian Toadflax*, Montana State University, Entomology Department, 1 year, \$20,000
- Collection & Screening of Insects for Biocontrol of Leafy Spurge*, Montana State University, Entomology Department, 1 year, \$22,900
- Development of Commercial Mycoherbicides for the Control of Knapweed*, Missoula County Conservation District, 1 year, \$10,000
- Novel Approaches to the Control of Spotted Knapweed*, Montana State University, Plant Pathology Department, 1 year, \$5,000
- Conditioning Cattle to Eat Leafy Spurge*, Montana State University, Range & Animal Sciences Department, 1 year, \$10,000

- Judith Basin Yellow Mignonette Research & Eradication Project, Central Montana Research Center (MSU), 1 year, \$4,000

Educational Programs

- Resource Education Awareness Weed Project, Missoula County Conservation District, 1 year, \$4,000
- Marias River Basin Weed Control Project Coordinator, Glacier, Liberty, Toole and Pondera County Weed Districts, 1 year, \$20,000
- Madison County Weed Seed Free Feed Program, Madison County Weed District, 1 year, \$2,000
- Spotted Knapweed Poster Update, Butte/Silver Bow Extension Service, 1 year, \$1,200
- 1989 Spotted Knapweed Symposium, Montana State University, Plant & Soil Sciences Department, 1 year, \$2,500
- Montana Noxious Weed Free Hay Program, Montana Cooperative Extension Service, Lewis & Clark and Gallatin Counties, 2 years, \$15,000
- Educational Tour for Eastern Montana County Commissioners and Weed Boards, Richland County Extension Service, 1 year, \$5,619
- MSU Chemical Safety Kit, Montana State University, Plant & Soil Sciences Department, 1 year, \$4,000
- 1989 Montana Weed Fair, Carbon County Weed District, 1 year, \$2,000

1990

- Projects funded by the herbicide surcharge and a \$1.50 per vehicle weed fee

Local Cooperative Weed Programs

Beaverhead County

- Wise River Area, Beaverhead County Weed District, 1 year, \$5,000 +

Big Horn County

- Big Horn County Chemical Cost-Share Assistance Program, Big Horn County Weed District, 1 year, \$10,000 +
- Dalmatian Toadflax Fee Land Control Assistance Project, Big Horn County Weed District, 1 year, \$15,000

Carbon County

- Bluewater Creek Leafy Spurge Control Project, Carbon County Weed District, 3 years, \$24,500 +

- Upper Rock Creek Weed Control Project, Carbon County Weed District, 1 year, \$5,000 +

Carter County

- Little Beaver Leafy Spurge Project, Carter County Weed District, 3 years, \$18,500 +
- Whitetop Control Program, Carter County Weed District, 2 years, \$8,000 +

Cascade County

- Little Belt Creek Drainage, Cascade County Weed District, 2 years, \$9,000 +
- Purple Loosestrife Survey and Control, Cascade County Weed District, 3 years, \$13,500 +

Deer Lodge County

- Anaconda-Deer Lodge Weed Project, Deer Lodge County Weed District, 1 year, \$42,500 +

Fergus County

- Grass Range Cooperative Weed Management Program, Fergus County Weed District, 2 years, \$18,900 +

Gallatin County

- Gallatin County Weed Control District, Gallatin County Weed District, 3 years, \$2,000 +
- Phase Two, Bridger Leafy Spurge Project, Gallatin County Weed District, 1 year, \$7,400 +
- West Gallatin River Knapweed Initiative, Gallatin County Weed District, 2 years, \$8,000 +

Glacier County

- St. Mary Weed Committee, Glacier County Weed District, 1 year, \$5,000 +

Granite County

- Bearmouth Weed District, Granite County Weed District, 1 year, \$29,100 +
- Douglas-Barnes Creek Weed District, Granite County Weed District, 1 year, \$31,395 +
- Marshall Creek Weed District, Granite County Weed District, 2 years, \$4,830 +
- Maxville Weed District, Granite County Weed District, 1 year, \$2,180 +
- North Cow Creek Weed District, Granite County Weed District, 1 year, \$9,900 +
- Poison Patch Weed District, Granite County Weed District, 1 year, \$11,110 +
- Rattler Weed District, Granite County Weed District, 1 year, \$14,000 +
- Seldom Seen Weed District, Granite County Weed District, 1 year, \$11,590 +

- Skalkaho Weed District, Granite County Weed District, 1 year, \$2,420 +
- Trout Creek Weed Control Project, Granite County Weed District, 1 year, \$4,225 +

Hill County

- Sage Creek Noxious Weed Project, Hill County Weed District, 1 year, \$8,000

Lake County

- Irvine Flats Weed Control Project, Lake County Conservation District, 1 year, \$15,000
- Purple Loosestrife Management Area, Lake County Weed District, 3 years, \$25,500 +

Liberty County

- Lower Pondera Creek Weed Committee, Liberty County Weed District, 1 year, \$5,000 +

Madison County

- 287 Project Area, Madison County Weed District, 1 year, \$4,150 +
- Alder Gulch Coop Control Unit, Madison County Weed District, 1 year, \$2,980 +
- Big Hole Coop Weed Control Unit, Madison County Weed District, 1 year, \$1,135 +
- Biltmore Hot Springs Coop Weed Control Unit, Madison County Weed District, 1 year, \$2,095 +
- Carey-Tuke Lanes Coop Weed Control Unit, Madison County Weed District, 1 year, \$2,485 +
- High Road Coop Weed Control Unit, Madison County Weed District, 1 year, \$5,075 +
- Laurin Canyon Coop Weed Control Unit, Madison County Weed District, 1 year, \$2,235 +
- Madisonian Hill Coop Weed Control Unit, Madison County Weed District, 1 year, \$2,450 +
- MAGPI Coop Weed Control Unit, Madison County Weed District, 1 year, \$930 +
- Shining Mountain Coop Weed Control Unit, Madison County Weed District, 1 year, \$3,445 +
- Waterloo Coordinated Weed Area, Madison County Weed District, 1 year, \$4,510 +
- Willow-Norwegian Coop Control Unit, Madison County Weed District, 1 year, \$4,010 +

Meagher County

- Lower Smith River Weed Project, Meagher County Weed District, 1 year, \$10,000 +

Missoula County

- Bitterroot Valley Weed Management Area, Missoula County Weed District, 1 year, \$13,418 +
- Grant Creek West Weed Control District, Missoula County Weed District, 1 year, \$8,446 +
- Lower Ninemile Valley Weed Management Area, Missoula County Weed District, 1 year, \$5,978 +
- Piney Meadows Weed Control, Missoula County Weed District, 1 year, \$4,686 +
- Upper Ninemile Weed Control District, Missoula County Weed District, 1 year, \$9,758 +

Park County

- Mill Creek/Emigrant Knapweed Control Project, Park County Weed District, 2 years, \$12,200 +
- Rock Creek Leafy Spurge District, Park County Weed District, 1 year, \$5,000 +
- Spring Creek Weed District, Park County Weed District, 2 years, \$3,800 +

Phillips County

- Phillips County Weed Cost Share Program, Phillips County Weed District, 1 year, \$11,000 +

Pondera County

- Sheep Creek Weed Committee, Pondera County Weed District, 1 year, \$5,000
- Upper Pondera Creek Weed Committee, Pondera County Weed District, 1 year, \$5,000 +

Powder River County

- Knapweed Project #2 - Southeastern Montana, Powder River County Extension Service, 1 year, \$30,000 +

Powell County

- Helmville Valley Weed District, Powell County Weed District, 1 year, \$8,545
- Ovando Valley Weed Control Project, Powell County Weed District, 1 year, \$9,580
- Ovando Valley Addition Weed Control Project, Powell County Weed District, 1 year, \$3,645
- South Garnett Weed District, Powell County Weed District, 1 year, \$13,980

Sanders County

- Big Bend Weed Project, Sanders County Weed District, 2 years, \$20,000 +
- Markle Hill Weed Project, Sanders County Weed District, 2 years, \$12,000 +

- Niarada Weed Control Project, Sanders County Weed District, 1 year, \$15,000 +

Silver Bow County

- Brown's Gulch Weed Project, Silver Bow County Weed District, 2 years, \$10,500 +

Sweet Grass County

- Melville Weed Cooperative, Sweet Grass County Weed District, 2 years, \$20,000 +

Multi-County Projects

- Tri-County Leafy Spurge Project, Prairie, Wibaux and Fallon County Weed Districts, 1 year, \$20,000
- Bundy Weed Project, Golden Valley and Musselshell County Weed Districts, 1 year, \$5,700 +

Research Projects

- Weed Seed Dormancy, Montana State University, Plant & Soil Sciences Department, 2 years, \$35,000 +
- Training Cattle to Tolerate Leafy Spurge*, Montana State University, Animal & Range Sciences Department, 1 year, \$45,000 +
- Establishment of Biocontrol Insectaries for Leafy Spurge Control*, Northeast Montana Weed Committee, 1 year, \$12,000
- Biological Control of Musk Thistle*, Montana State University, Entomology Department, 2 years, \$15,000 +
- Screening and Collection of Insects for Leafy Spurge Control*, Montana State University, Entomology Department, 1 year, \$68,000 +
- Screening and Collection of Insects for Dalmatian Toadflax Control*, Montana State University, Entomology Department, 1 year, \$53,000 +
- Screening of Insects for Spotted Knapweed Control, Western Montana Research Center (MSU), 1 year, \$45,800 +
- Foreign Collection of Insects for Spotted Knapweed Control*, Western Montana Research Center (MSU), 1 year, \$26,400 +
- Novel Approaches to the Control of Spotted Knapweed*, Montana State University, Plant Pathology Department, 1 year, \$10,000 +
- A Management Scheme for Herbicide-Resistant Weeds in Montana, Montana State University, Plant & Soil Sciences Department, 1 year, \$24,000 +

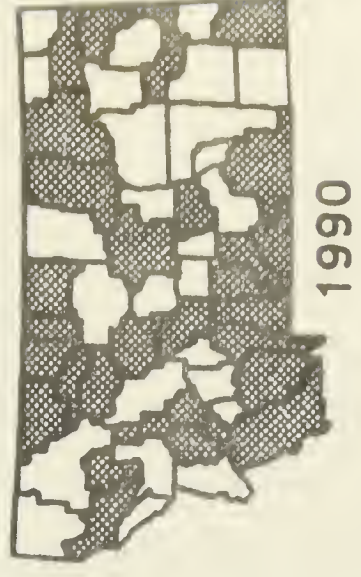
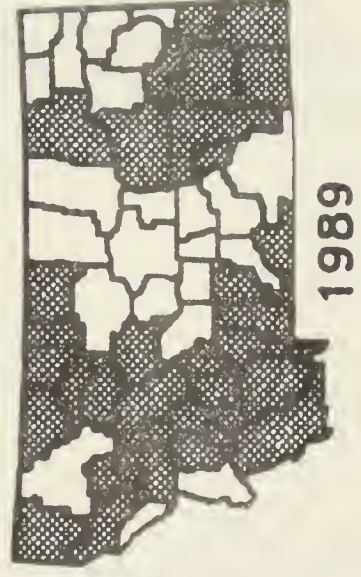
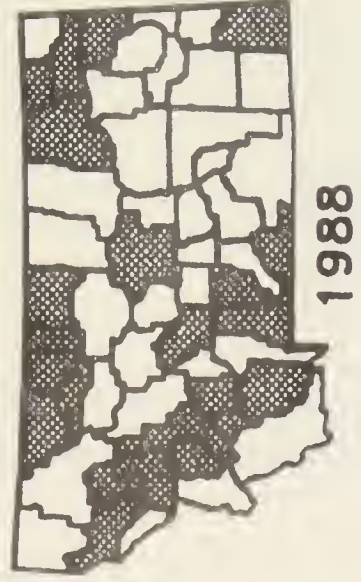
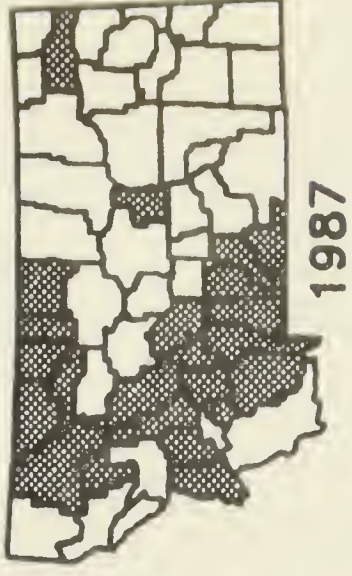
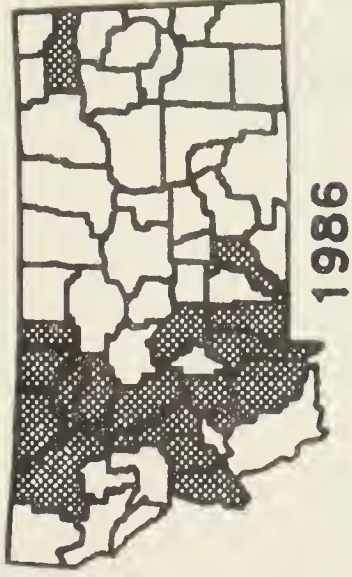
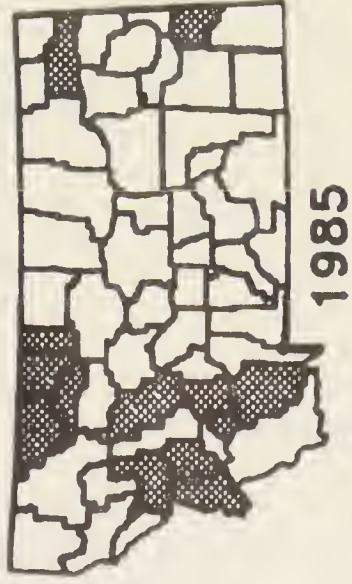
Educational Programs

- Weed Identification Handbook, Montana Weed Control Association, 1 year, \$4,330

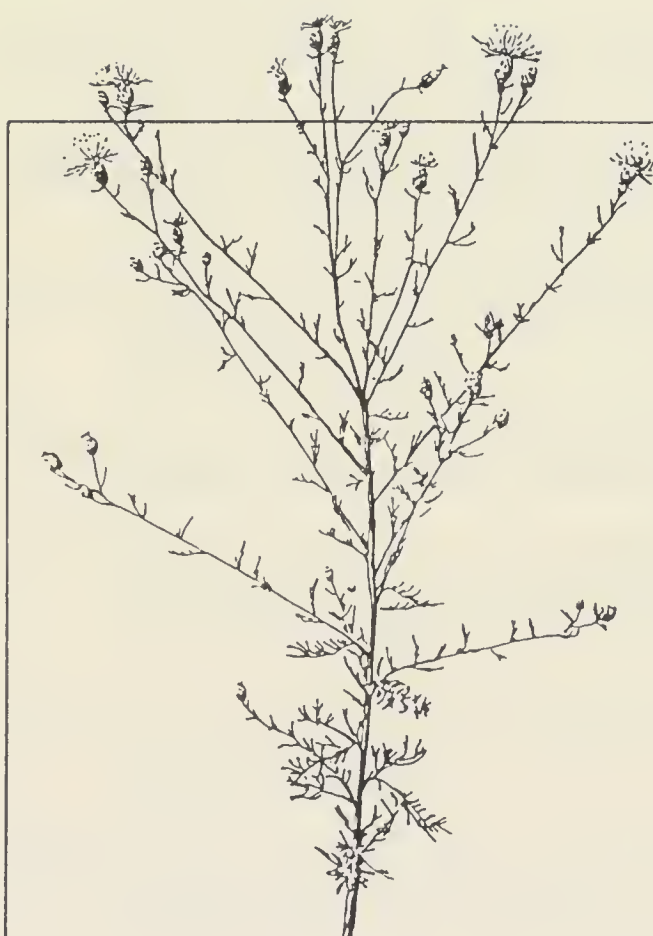
- Development of a Forage Production Training Workshop, Montana State University, Plant & Soil Sciences Department, 1 year, \$5,550
- Testing for Water Quality, Big Horn County Extension Service, 3 years, \$6,300 +
- Weed Publicity for Montana, Montana Weed Control Association, 1 year, \$25,000 +
- Geographic Information Systems for Weed Control and Ground Water Protection, Montana State University, Entomology Department, 1 year, \$13,000 +
- Stillwater County Plant Management and Awareness Program, Stillwater County Weed District & Extension Service, 3 years, \$44,000 +
- Resource Education Awareness Weed Project, Phase III, Missoula County Conservation District, 1 year, \$15,000
- Development of a Montana Weeds Video, Missoula County Conservation District, 1 year, \$7,770 +

Montana Noxious Weed Trust Fund Projects

1985-1990



Research Publications Resulting From NWTF Grants



APPENDIX E

Noxious Weed Trust Fund

Programmatic Environmental Impact Statement

APPENDIX E

LIST OF PUBLICATIONS RESULTING FROM RESEARCH FUNDED BY THE NWTF

RESEARCH PROJECTS FUNDED IN 1985

Project: **Biological Control of Noxious Weeds Using a Fungus**
(2 years - \$90,700)

Publications:

- Ford, E.J., R.V. Miller, and D.C. Sands. 1990.** A selective medium for *Sclerotinia sclerotiorum*. In prep.
- Long, D.H., R.V. Miller, E.J. Ford, and D.C. Sands. 1991.** Linear growth analysis of *Sclerotinia sclerotiorum*; a method for predicting formulation parameters. In: Proceedings, American Phytopathological Society. St. Louis, Missouri. In press.
- Miller, R.V., E.J. Ford, D.C. Sands, and C.A. Hertoghe. 1991.** Virulence and organic acid production by mutants of *Sclerotinia sclerotiorum*. In: American Phytopathological Society. St. Louis, Missouri. In press.
- Miller, R.V., E.J. Ford, and D.C. Sands. 1987.** Reduced host-range mutants of *Sclerotinia sclerotiorum*. Abstracts, American Phytopathological Society. Cincinnati, OH.
- Miller, R.V., E.J. Ford, and D.C. Sands. 1987.** Induced auxotrophic and non-sclerotial isolates of *Sclerotinia sclerotiorum*. Abstracts, American Phytopathological Society. Cincinnati, OH.
- Miller, R.V., E.J. Ford, and D.C. Sands. 1986.** Reduction of the host range of *Sclerotinia sclerotiorum* by mutagenesis. Sixth North American *Sclerotinia* Workshop. Saskatoon, Saskatchewan, Canada.
- Sands, D.C., E.J. Ford, and R. V. Miller. 1990.** Genetic manipulation of broad-host range fungi for biological control of weeds. *Weed Technology* 4:471-474.
- Sands, D.C., R.V. Miller, and E.J. Ford. 1990.** Biotechnological approaches to control weeds with pathogens. In: Microbes and microbial products as herbicides. ACS Symposium Series 439. American Chemical Society. Washington, DC, pp. 184-190.
- Sands, D.C., R.V. Miller, E.J. Ford, and K. Glass. 1991.** Genetic containment for biocontrol agents. In: Proceedings, rhizobacteria - prospects for weed management. Pullman, Washington. In press.
- Sands, D.C. and R.V. Miller. 1990.** Genetic containment for biological control agents. Abstracts, American Phytopathological Society. Grand Rapids, Michigan.

RESEARCH PROJECTS FUNDED IN 1986

Project: **Leafy Spurge Biological Control with Sheep**
(2 years - \$5,000)

Publications:

Pryor, Bill. 1986. Goats: spurge scourge. Montana Outdoors 17(4):11.

Marchesseault, Betsy. 1986. Goats don't let spurge set seed. Montana Farmer-Stockman.
September 4. p.11.

Video produced "The Scourge of Spurge."

RESEARCH PROJECTS FUNDED IN 1987

Project: **Survey of Weeds in Conservation Tilled Fields**
(1 year - \$7,000)

Publicatlons:

Nelson, J.E., B. Mullin, D. Wichman, and K. Schweitzer. 1988. Survey of weeds in conservation and conventionally tilled grain fields in Montana. In: Proceedings, Western Society of Weed Science 41:133.

Project: **Influence of Spotted Knapweed on Runoff**
(1 year - \$1,300)

Publications:

Lacey, J.R. and C.B. Marlow. 1989. Spotted knapweed invasion of bunchgrass ranges- a concern for soil and water conservation. In: Proceedings, range weeds revisited. Pacific Northwest Range Management Shortcourse. Washington State University. Pullman, WA.

Lacey, J.R., C.B. Marlow, and J.R. Lane. 1989. Influence of spotted knapweed on surface runoff and sediment yield. Weed Technology 3:627-631.

RESEARCH PROJECTS FUNDED IN 1988

Project: **Using Angora Goats for Leafy Spurge Control**
(2 year - \$18,000; money returned after successful completion of project).

Publications: None

Project: **Biological Control of Noxious Weeds Using a Fungus**
(1 year - \$17,000).

Publications:

Miller, R.V., E.J. Ford, N.J. Zidack, and D.C. Sands. 1989. Apyrimidine auxotroph of *Sclerotinia sclerotiorum* for use in biological weed control. *Journal of General Microbiology* 135:2085-2091.

Miller, R.V., E.J. Ford, and D.C. Sands. 1989. A non-sclerotial pathogenic mutant of *Sclerotinia sclerotiorum*. *Canadian Journal of Microbiology* 35:517-520.

Project: **Potential of Tansy Mustard to Cause Photosensitization in Cattle**
(2 years - \$5,665)

Publications:

Pfister, J.A., J.R. Lacey, D.C. Baker, L.F. James, R. Brownson. 1990. Is tansy mustard causing photosensitization of cattle in Montana? *Rangelands* 12:170-172.

Pfister, J.A., D.C. Baker, J.R. Lacey, R. Brownson. 1989. Photosensitization in cattle in Montana: Is *Descurania pinnata* the culprit? *Journal of Veterinarian and Human Toxicology* 31:225-227.

Project: **Control of Spotted Knapweed Using Livestock-defoliation, Competition and Shading Effects** (1 year - \$27,802)

Publications:

Kennett, G.A., J. R. Lacey, C.A. Butt, K.M. Olson-Rutz, M.R. Haffercamp. 1991. Effects of defoliation, shading, and competition on spotted knapweed and bluebunch wheatgrass. *Journal of Range Management*. In press.

Project: **Control and Management of Weeds in CRP**
(2 years - \$27,802)

Publications:

Nelson, Jim. and Greg McKinney. 1989. A grower guide for establishing perennial grasses and legumes on Conservation Reserve Program acreage. Montana State University Cooperative Extension Service Bul. EB36.

Nelson, Jim and Greg McKinney. 1989. Technical herbicide information for Conservation Reserve Program acreage, Montana State University Cooperative Extension Service. Bull. EB 37.

Project: **Survey of Weeds in Conservation Tilled Fields**
(1 year - \$9,666)

Publications:

Nelson, J.E., B. Mullin, D. Wichman, and K. Schweitzer. 1989. Survey of weeds in conservation and conventionally tilled grain fields in Montana. In: Proceedings, Western Society of Weed Science. 42:188.

RESEARCH PROJECTS FUNDED IN 1989

Project: **Development of Commercial Mycoherbicides for the Control of Knapweed**
 (1 year - \$10,000)

Publications:

Ford, E.J. 1989. *Sclerotinia* as a mycoherbicide. In: Proceedings, 1989 spotted knapweed symposium. Montana State University. Bozeman, MT. p. 190.

Miller, R.V. and D.C. Sands. 1991. Fitness of genetically altered fungi. The fungal community: its organization and role in the ecosystem. 2nd Ed. Marcel Dekker, Inc., New York. In Press.

Project: **Novel Approaches to the Control of Spotted Knapweed**
 (1 year - \$5,000)

Publications:

Spierle, A., J. Cardellina, G.A. Strobel. 1989. Phytotoxins from *Alternaria alternata*, a pathogen of spotted knapweed. *Journal of Natural Products* 52:42-47.

Project: **Conditioning Cattle to Eat Leafy Spurge**
 (1 year - \$10,000; funds returned).

Publications:

Muller, B., P.K. Fay, and M. Peterson. 1990. Feeding leafy spurge hay to cows. In: Proceedings, Western Society of Weed Science 43:31.

Project: **Judith Basin Yellow Mignonette Research and Eradication Project**
 (1 year - \$4,000)

Publication:

Wichman, D.M. 1990. Yellow mignonette biology and control. In: Proceedings, Western Society of Weed Science 43:58.

RESEARCH PROJECTS FUNDED IN 1990

Project: **Weed Seed Dormancy**
(2 years - \$35,000)

Publicatlons:

Dyer, W. E. 1990. Regulation of gene expression during imbibition of dormant and non-dormant wild oat embryos. In: Proceedings, Western Society of Weed Science 43:109.

Dyer, W.E. 1991. Differential gene expression during imbibition of dormant and non-dormant wild oat embryos. Abstracts, Weed Science Society of America. 31:157.

Dyer, W.E. 1991. Dormancy associated MRNA and proteins in imbibing *Avena fatua*. Journal of Plant Physiology. In review.

Project: **Training Cattle to Tolerate Leafy Spurge**
(1 year - \$45,000)

Publicatlons: None

Project: **Novel Approaches to the Control of Spotted Knapweed**
(1 year - \$10,000)

Publicatlons:

Strobel, G.A. 1991. Biological control of weeds. Scientific American 265:1:72- 78.

Strobel, G.A., A. Spierle, Sang Ho Park, and J. Cardellina. 1990. Maculosin: a host phytotoxin from *Alternaria alternata* on spotted knapweed. Microbes and Microbial Products as Herbicides. American Chemical Society. pp 53-62.

Project: **A Management Scheme for Herbicide-resistant Weeds in Montana**
(1 year - \$24,000)

Publicatlons:

Carda, K.M., D. Mulugeta, P.K. Fay, and E.X. Davis. 1991. The residual properties of trilasulfuron in Montana. In: Proceedings, Western Society of Weed Science 44:80-81.

Davis, E.S. and P.K. Fay. 1991. A bloassay to measure the frequency of sulfonylurea resistance in weed populations. In: Proceedings, Western Society of Weed Science 44:26-27.

Mulugeta, D., P.K. Fay, W.E. Dyer. 1991. Role of pollen in the spread of chlorosulfuron resistant *Kochia scoparia*. Abstracts, Weed Science Society of America 31:136.

Publications: (continued)

Mulugeta, D., P.K. Fay, W.E. Dyer, L.E. Talbert. 1991. Inheritance of resistance to sulfonyl-urea herbicides in *Kochia scoparia*. In: Proceedings, Western Society of Weed Science 44:81.

Sivakumaran, K., D. Mulugeta, S.A. Gerhardt, P.K. Fay, W.E. Dyer. 1991. Characteristics of diverse sulfonyl urea resistant and susceptible *Kochia scoparia* acc. In: Proceedings, Western Society of Weed Science 44:82.

EPA Herbicide Labels



APPENDIX F

Noxious Weed Trust Fund

Programmatic Environmental Impact Statement

Tordon* 22K

Herbicide

For use in areas west of the Mississippi River for the control of susceptible broadleaf weeds and woody plants on rangeland and permanent grass pastures, fallow cropland, wheat, barley and oats not underseeded with a legume on grainland (which is not flood or sub-irrigated and not rotated to broadleaf crops), non-cropland, and on Conservation Reserve Program (CRP) acres and wildlife openings in forest and non-crop areas

Active Ingredient:

picloram: 4-amino-3,5,6-trichloropicolinic acid, as the potassium salt	24.4%
Inert Ingredients	75.6%
TOTAL	100.0%

Acid Equivalent:

picloram: 4-amino-3,5,6-trichloropicolinic acid - 21.1% - 2 lb/gal
EPA Reg. No. 62719-6

KEEP OUT OF REACH OF CHILDREN

WARNING

AVISO:

PRECAUSCION AL USUARIO:

Si usted no lee ingles, no use este producto hasta que la etiqueta le haya sido explicada ampliamente.

PRECAUTIONARY STATEMENTS

Hazards to Humans and Domestic Animals

Causes Substantial But Temporary Eye Injury - Harmful if Inhaled Or Absorbed Through Skin

Do not get in eyes or on clothing. Wear goggles, face shield or safety glasses when handling. Avoid contact with skin. Wash thoroughly with soap and water after handling. Remove contaminated clothing and wash before reuse. Avoid breathing spray mist.

First Aid

If in eyes: Flush with plenty of water for at least 15 minutes. Get medical attention.

Environmental Hazards

Do not apply directly to water or wetlands (swamps, bogs, marshes, and potholes). Do not contaminate water when disposing of equipment washwaters. Do not contaminate water used for irrigation or domestic purposes by cleaning of equipment or disposal of wastes. Do not allow run-off or spray to contaminate wells, irrigation ditches or any body of water used for irrigation or domestic purposes. Do not make application when circumstances favor movement from treatment site.

Picloram is a chemical which can travel (seep or leach) through soil and under certain conditions has the potential to contaminate groundwater which may be used for irrigation and drinking purposes. Users are advised not to apply picloram where soils have a rapid to very rapid

permeability throughout the profile (such as loamy sand to sand) and the water table of an underlying aquifer is shallow or to soils containing sinkholes over limestone bedrock, severely fractured surfaces, and substrates which would allow direct introduction into an aquifer. Your local agricultural agencies can provide further information on the type of soil in your area and the location of groundwater.

An aquifer is defined as "an underground, saturated, permeable, geologic formation capable of producing significant quantities of water to a well or spring. It is the ability of the saturated zone, or portion of that zone, to yield water which makes it an aquifer" (American Chemical Society, 1983).

Note: Use in Hawaii limited exclusively to Supplemental Labeling. See "General Use Precautions" for details.

NOTICE

READ THE ENTIRE LABEL. USE ONLY ACCORDING TO LABEL DIRECTIONS.

Before buying or using this product, read Warranty Disclaimer and Limitation of Remedies sections elsewhere on this label.

IN CASE OF AN EMERGENCY

endangering life or property involving this product, call collect 517-636-4400

AGRICULTURAL CHEMICAL

Do Not Ship or Store with Food, Feeds, Drugs, or Clothing

Tordon* 22K

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

Read all "DIRECTIONS FOR USE" carefully before applying.

Do not use for manufacturing or formulating.

Chemigation: Do not apply this product through any type of irrigation system.

STORAGE AND DISPOSAL

Do not contaminate water, food, feed or fertilizer by storage or disposal. Open dumping is prohibited.

Pesticide Disposal: Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility.

Metal Container Disposal: Do not reuse container. Triple rinse (or equivalent). Puncture and dispose of in a sanitary landfill, or by other procedures approved by state and local authorities.

Plastic Container Disposal: Do not reuse container. Triple rinse (or equivalent). Puncture and dispose of in a sanitary landfill, or by incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

Sprayer Clean-Out: To avoid injury to desirable plants, equipment used to apply Tordon 22K should be thoroughly cleaned before reusing to apply any other chemicals.

1. Rinse and flush application equipment thoroughly after use. Dispose of rinse water in non-cropland area away from water supplies.
2. Rinse a second time, adding 1 quart of household ammonia for every 25 gallons of water. Circulate the solution through the entire system so that all internal surfaces are contacted (15 to 20 minutes). Let the solution stand for several hours, preferably overnight.
3. Flush the solution out the spray tank through the boom.
4. Rinse the system twice with clean water, recirculating and draining each time.
5. Nozzles and screens should be removed and cleaned separately.

General: Consult federal, state or local disposal authorities for approved alternative procedures.

GENERAL INFORMATION

In areas west of the Mississippi River use Tordon 22K herbicide to control susceptible broadleaf weeds and woody plants on rangeland and permanent grass pastures, fallow cropland, wheat, barley and oats not underseeded with a legume on grainland (which is not flood or sub-irrigated and not rotated to broadleaf crops), non-cropland, and on Conservation Reserve Program (CRP) acres, and wildlife openings in forest and non-crop areas.

GENERAL USE PRECAUTIONS

Use this product only as specified on this label. Observe any special use and application restrictions and limitations, including method of application and permissible areas of use as promulgated by state or local authorities.

This product is **NOT** for sale or use in the San Luis Valley of Colorado.

In Hawaii, approved uses of Tordon 22K are limited to those described in Supplemental Labeling. This Supplemental Labeling may be obtained from your DowElanco representative or chemical dealer. Refer to this Supplemental Labeling for specific use directions and precautions.

Do not make application when circumstances favor movement from treatment site.

Do not apply or otherwise permit Tordon 22K or sprays containing Tordon 22K to contact crops or other desirable broadleaf plants, including but not limited to alfalfa, beans, grapes, melons, peas, potatoes, safflower, soybeans, sugar beets, sunflower, tomatoes, and other vegetable crops, flowers, fruit plants, ornamentals or shade trees nor the soil containing roots of nearby valuable plants.

Avoid Injurious Spray Drift. Applications should be made to avoid spray drift since very small quantities of spray, which may not be visible, may seriously injure susceptible crops during both growing and dormant periods. To minimize spray drift, use low nozzle pressure; apply as a coarse spray; and use nozzles designed for herbicide application that do not produce a fine droplet spray. To aid in further reducing spray drift, a drift control and deposition aid such as Nalco-Trol may be used with this product. If such a drift control aid is used, follow all use recommendations and precautions on the product label.

Ground Equipment

With ground equipment spray drift can be lessened by keeping the spray boom as low as possible; by applying 20 gallons or more of spray per acre; by keeping the operating spray pressures at the manufacturers recommended minimum pressures for the specific nozzle type used (low pressure nozzles are available from spray equipment manufacturers); by spraying when the wind velocity is low (follow state regulations). Avoid calm conditions which may be conducive to air inversions. In hand-gun applications, select the minimum spray pressure that will provide adequate plant coverage (without forming a mist).

Aerial Application

With aerial applications, drift may be lessened by using a coarse spray; by using a drift control system; or by using Nalco-Trol drift control additive or equivalent; by keeping spray pressures low enough to provide coarse spray droplets; and by using nozzles which do not create fine droplets. Spray boom should be no longer than 3/4 of the wingspan or rotor length. Do not use a thickening agent with the Microfoil or the Thru-Valve booms, or other systems that cannot accommodate thick sprays. Spray only when the wind velocity is low (follow state regulations). Avoid calm conditions which may be conducive to air inversions.

Determine Air Movement and Direction Before Foliar Application. Do not spray when wind is blowing toward susceptible crops or ornamental plants near enough to be injured. It is suggested that a continuous smoke column at or near the spray site or a smoke generator on the spray equipment be used to detect air movements, lapse conditions, or temperature inversions (stable air). If the smoke layers or indicates a potential of hazardous spray drift, do not spray.

Do not contaminate water intended for irrigation or domestic purposes. To avoid injury to crops or other desirable plants, do not treat or allow spray drift or run-off to fall onto banks or bottoms of irrigation ditches, either dry or containing water, or other channels that carry water that may be used for irrigation or domestic purposes.

Do not use on flood or sub-irrigated land.

Do not spray if the loss of forage legumes cannot be tolerated. Tordon 22K may injure or kill legumes. New legume seedlings may not grow for several years following application of this herbicide.

Do not use manure from animals grazing treated areas on land used for growing broadleaf crops, ornamentals, orchards or other susceptible, desirable plants. Manure may contain enough picloram to cause injury to susceptible plants.

Do not use grass or hay from treated areas for composting or mulching of susceptible broadleaf crops.

Do not transfer livestock from treated grazing areas onto sensitive broadleaf crop areas without first allowing 7 days of grazing on an untreated grass pasture. Otherwise, urine may contain enough picloram to cause injury to sensitive broadleaf plants.

Do not apply to snow or frozen ground. Application during very cold (near freezing) weather is not advisable.

Tordon 22K should not be applied on residential or commercial lawns or near ornamental trees and shrubs. Untreated trees can occasionally be affected by root uptake of herbicide through movement into the top soil or by excretion of the product from the roots of nearby treated trees. Do not apply Tordon 22K within the root zone of desirable trees unless such injury can be tolerated.

Do not rotate food or feed crops on treated land if they are not registered for use with picloram until an adequately sensitive bioassay or chemical test shows that no detectable picloram is present in the soil.

Do not move treated soil to areas other than those treatment sites for which Tordon 22K is registered for use. Also, do not use treated soil to grow plants for which use of Tordon 22K is not registered until an adequately sensitive bioassay or chemical test shows that no detectable residue of picloram is present in the soil.

Do Not Mix With Dry Fertilizer.

Woody Plants and Broadleaf Weeds Controlled by Tordon 22K

Woody Plants:

absinth wormwood	gorse
aspen	junipers/cedars
blackberries	locust
catclaw acacia	pinon pine
chaparral sp.	rabbitbrush
fringed sagebrush	Scotch broom

Annual and Perennial Broadleaf Weeds:

brackenfern	lambsquarters	toadflaxes
buckwheat, wild	leafy spurge	thistles
buffalobur	locoweeds	artichoke
bursage	lupines	beaumont
burweed	milkweed	bull
camas, death	ox-eye daisy	Canada
camelthorn	pigweed	distaff
clover	pricklypear cactus	golden
crupina	ragweeds	Italian
dock	common	musk
field bindweed	bur	plumeless
goldenrod	lanceleaf	Scotch
horsenettle	western	wavy leaf
Carolina	rush skeletonweed	
white	Russian thistle	
horseweed	snakeweeds	
ironweed	sowthistle	
knapweed	starthistles	
diffuse	Iberian	
Russian	purple	
spotted	yellow	
squarrose	St. Johnswort	
larkspurs	sunflower	
geyer	tansy ragwort	
plains	tasajillo	
tall		

To prevent damage to crops and other desirable plants, read and follow all directions and precautions on this label and container before using.

MIXING AND APPLICATION DIRECTIONS

Mix the required amount of Tordon 22K in water and apply as a coarse low pressure spray using ground equipment or aircraft. Use enough spray volume to provide uniform coverage of the weeds. For best results treat when the weeds are growing actively in the spring before full bloom or late summer into fall. Treatments during full bloom or seed stage of some weeds may not give good control.

To prepare the spray, add about half the desired amount of water in the spray tank. Then with agitation, add the recommended amount of Tordon 22K and other registered tank mix herbicides. Finally, with continued agitation, add the rest of the water and additives such as surfactants or drift control and deposition aids.

Use with surfactants

Addition of wetting or penetration agents is not usually necessary when using Tordon 22K. Under extreme conditions, such as drought, addition of a surfactant may improve efficacy. However, if foliar burn occurs too rapidly, translocation of Tordon 22K will not occur and control of perennial weeds, such as field bindweed, may be reduced.

Use With Sprayable Liquid Fertilizer Solutions

Tordon 22K is compatible with most non-pressurized liquid fertilizer solutions; however, if these solutions are to be sprayed with Tordon 22K, a compatibility test (jar test) should be made prior to mixing. Jar tests are particularly important when a new batch of fertilizer or pesticide is used, when water sources change, or when tank mixture ingredients or concentrations are changed. Compatibility may be determined by mixing the spray components in the desired order and proportions in a clear glass jar before large scale mixing of spray components in the spray tank. Use of a compatibility aid such as Unite or Compex may help obtain and maintain a uniform spray solution during mixing and application. Agitation in the spray tank must be vigorous to be comparable with jar test agitation. For best results, liquid fertilizer rates should not exceed 50% of the total spray volume. Premix Tordon 22K with water and add to the liquid fertilizer/water mixture while agitating contents of the spray tank. Apply the spray the same day it is prepared while maintaining continuous agitation. Rinse spray tank thoroughly after use.

Note: Foliar applied liquid fertilizers can cause yellowing or leaf burn of crop foliage.

Weed Control Guidelines for Tordon 22K in Non-cropland, Range and Pasture†

Weed Species ¹	Rate/Acre	Comments
biennial thistles bull before musk plumeless Scotch	Fall: 1/2 pint Spring: 6-8 fl oz with 1.0 lb ae 2,4-D	Apply when thistles are in the rosette stage bolting in the spring or in the fall prior to soil freeze up
diffuse knapweed spotted knapweed fringed sagebrush snakeweed ² yellow starthistle ² ox-eye daisy death camas ²	1 pint	
absinth wormwood goldenrod geyer larkspur ² plains larkspur ² lupines ² pricklypear cactus rabbitbrush sp. locoweeds ² common tansy buffalobur bursage crupina	1 - 2 pints	Tank mix 1.0 lb ae of 2,4-D with the lower rate of Tordon 22K. For pricklypear, use of a diesel oil-water-emulsifier spray mixture may improve control.

TORDON® 22K

Weed Species ^{††}	Rate/Acre	Comments <small>cont.</small>
Canada thistle field bindweed St. Johnswort perennial sowthistle	1 - 3 quarts as a spot treatment. 1-2 pints tank-mixed with 1.0 lb ae of 2,4-D as a broadcast treatment.	Lower rates will require annual re-treatment for several years. Re-treat when control drops below 80%.
dalmatian toadflax yellow toadflax tall larkspur ^{†††} Russian knapweed	1 - 4 quarts	Lower rates will require annual re-treatment for several years. Use 2 to 4 quarts as a spot treatment only.
leafy spurge ^{†††} rush skeletonweed tansy ragwort gorse juniper		Addition of 1.0 lb ae of 2,4-D may improve control with 1 quart rate. Re-treat when control drops below 80%.

† For additional species or more specific rates consult your area's current Weed Control Guide and/or your local DowElanco representative.

†† Many seedling annual weeds can be controlled using pt/acre.

††† Denotes poisonous plants.

For rates exceeding 1 quart/acre, apply only as a spot treatment and the total area treated in a single season should not exceed 25% of a landowner's acreage found in any particular watershed.

Local conditions may affect the use of herbicides. State agricultural experiment stations or extension service weed specialists in many states issue recommendations to fit local conditions. Be sure that use of this product conforms to all applicable regulations.

Spot Treatment

Use application rates as suggested in the above table or recommended by your area weed control specialist. Apply in a total spray volume of 20 to 100 gallons/acre. Make sure equipment is properly calibrated and that the amount of Tordon 22K added to the spray mixture corresponds to the desired rate and spray volume. (Contact your DowElanco Representative for a Calibration Guide.)

Do not exceed 4 quarts/acre in any one year as a spot treatment.

Tank Mixture for Spot or Broadcast Treatment of Susceptible Weeds

Tordon 22K may also be tank mixed with 2,4-D products or other registered herbicides for use on areas having mixed species including those which respond well to 2,4-D. Read and follow all directions and use precautions on other product labels.

APPROVED USES

Non-Cropland Areas

Use Tordon 22K to control susceptible broadleaf weeds and woody plants on non-cropland areas such as on roadsides or other rights-of-way, along fence rows, and around farm buildings. Use up to 1/2 gallon of Tordon 22K per acre as a broadcast treatment and spray to wet foliage and soil.

Rangeland and Permanent Grass Pastures

Use Tordon 22K on rangeland and permanent grass pastures

to control susceptible broadleaf weeds and woody plants such as (but not limited to) those shown in the table.

Grazing Restrictions: When applying more than 1 quart of Tordon 22K per acre, do not cut grass for feed within two weeks after treatment. Meat animals grazing for up to two weeks after treatment should be removed from treated areas three days prior to slaughter. Do not graze lactating dairy animals on treated areas within two weeks after treatment.

Broadcast Treatment (Ground and Aerial Applications)

Tordon 22K can be applied as a broadcast treatment by ground or aerially to control several broadleaf weeds and woody plants. Apply Tordon 22K at the suggested rates of 2 or more gallons of water per acre by air or in 10 or more gallons of water per acre by ground. Re-treat as necessary but do not exceed 1 quart of Tordon 22K per acre per season. For control of actively growing susceptible annual broadleaf weeds, including Russian thistle, apply 1/4 to 1/2 pint/acre of Tordon 22K. Tordon 22K can also be tank mixed with 1/2 to 1 pound/acre 2,4-D where species present are sensitive to 2,4-D.

Wick Applications

Mix 1 part of Tordon 22K with 2 parts of water to prepare a 33% solution. Apply when weeds are actively growing and are above most desirable plants. For ironweed and goldenrod, best results are obtained with applications made prior to early bud stage. Wick applicator should be drained and cleaned after each use. Ropes should be changed when flow is reduced from wear, extended use, poor cleaning or intermittent use.

Spot Treatment

See "Directions for Use".

Spot Concentrate Application

Eastern red cedar can be controlled with spot concentrate applications of Tordon 22K in either the spring (April-May) or fall (September-October). For best results, use 3 ml to 4 ml of Tordon 22K (undiluted) per 3 feet of plant height. Application should precede periods of expected rainfall. Apply directly to soil within the dripline and on the upslope side of the tree. Application to trees taller than 15 feet is not recommended. **Do not** use more than 2 pints of Tordon 22K per acre in any one year.

Tordon 22K at rates over 1 quart may suppress certain established grasses, such as brome grass, blue grama, and buffalograss. However, subsequent grass growth should be improved by release from weed competition.

Barley, Oats, and Wheat Not Underseeded With a Legume (Which is Not Flood or Sub-Irrigated and Not Rotated to Broadleaf Crops)

Use Tordon 22K for the control of susceptible annual broadleaf weeds such as (but not limited to) volunteer sunflower, wild buckwheat, lambsquarters, pigweed, Russian thistle, and sowthistle.

Broadcast Treatment (Ground and Aerial Applications)

Tordon 22K can be applied as a single broadcast treatment by ground or aerially to control several broadleaf weeds by itself or as a tank mix with 2,4-D, MCPA, or sulfonyleurea herbicides such as Ally. Apply Tordon 22K at the rates suggested in the table on page 11 in 2 to 5 gallons of water per acre by air or in 5 to 20 gallons of water per acre by ground. The addition of surfactants may aid control under dry conditions, but may cause injury to grain if used over the top. Read and follow directions and precautions on other product labels when tank mixing.

Do not apply Tordon 22K within 50 days before harvest.

Spray mixtures may cause shorter straw on some varieties of cereals but grain yields are usually not affected.

Do not graze or feed forage from treated areas for 2 weeks after treatment. Do not harvest hay from treated grain fields.

Use only on land that will be planted the following year to grass, barley, oats, wheat or fallowed. Do not apply more than 1 1/2 fluid ounces of Tordon 22K per acre during the small grain growing season.

Spring Wheat, Barley and Oats

Apply from the 3 to 5 leaf stage to the early jointing stage of growth as indicated in the table below. Applications at the 3 to 5 stage occasionally causes slight head malformations and straw shortening but normally does not affect yield.

Durum Wheat

Do not treat durum wheat since some varieties of durum wheat may be injured.

Winter Wheat and Barley

Apply after resumption of active growth in the spring until the early jointing stage.

USE RATES FOR WHEAT, BARLEY AND OATS†

Weeds	Weed Growth Stage††	Grain Growth Stage	Amounts of Each Product Per Acre†††		
			4.0 lb	6.0 lb	
			2,4-D or MCPA	2,4-D or MCPA	
More susceptible species, such as: lambsquarters pennycress wild mustard marestail	3 inches	3-5 leaf to early tillering	1 fl oz	1/2 pt	1/3 pt
	3-6 inches	Tillering to early jointing	1 1/2 fl oz	1/4 pt	1/2 pt
Less susceptible species such as: volunteer sunflower wild buckwheat Russian thistle pigweed Canada thistle, top growth suppression Kochia	1-6 inches	Tillering to early tillering	1 1/2 fl oz	3/4-1 pt	1/2-2/3 pt

† For oats, do not tank mix with 2,4-D herbicides.

†† For best results, treat when weeds have 2 to 4 leaves and are actively growing.

††† When measuring small amounts of Tordon 22K, special care should be taken not to exceed suggested rates.

The dosages recommended equate to 1/4 to 3/8 oz picloram (0.016 - 0.023 lb ae); 4 to 6 oz 2,4-D (0.25 - 0.38 lbs ae); 4 to 6 oz MCPA (0.25 - 0.38 lbs ae) per acre.

FALLOW CROPLAND (NOT ROTATED TO BROADLEAF CROPS)

Tordon 22K can be applied as a single broadcast treatment by ground or aerially to control susceptible broadleaf weeds by itself or as a tank mix with 2,4-D or other herbicides registered for this use. Apply Tordon 22K at suggested rates in 2 or more gallons of water per acre by air or in 5 or more gallons/acre by ground. Read and follow directions and precautions on other product labels when tank mixing.

In fallow grainland to control susceptible annual broadleaf weeds such as Russian thistle, apply 1/4 to 1/2 pint Tordon 22K alone or with 1/2 to 1 lb of 2,4-D when weeds are growing well.

In fallow grainland to control susceptible perennial broadleaf weeds such as bindweed and Canada thistle, apply Tordon 22K at 1/2 to 1 pint plus 1/2 to 1 pound of 2,4-D per acre after grain harvest. The treated area should extend at least 10 feet beyond the visible weeds. During the next season, treat the same fallow area with 1/2 pint of Tordon 22K plus 1/2 to 1 pound of 2,4-D per acre after weeds have emerged and are growing well, preferably at least 60 days before planting grain.

Control may be reduced if weeds are under stress from drought or extreme temperatures. Use 1/2 pint/acre to control light to moderate infestations under good growing conditions or to reduce the risk of crop injury. Use higher rates for heavy infestations and longer term control. Some regrowth will occur the following season.

Between crops of small grains, treat annually to maintain control of perennial weed infestation. For best results with continuous small grain production, treat field bindweed infested areas in June or July following small grain harvest, when bindweed is actively growing, applying the 1/2 pint rate of Tordon 22K and 1/2 to 1 pound 2,4-D ae/acre.

Do not apply more than 1 pint in any calendar year.

Tordon 22K at 1 pint or less per acre alone or plus 2,4-D or other registered herbicides may be applied by air in 2 or more gallons of spray under conditions that will prevent injury to any nearby susceptible crops or ornamentals. Refer to "General Use Precautions" for suggestions to reduce off-target drift hazard.

Spot Treatment

Spot treatments of Tordon 22K at rates over 1 pint/acre can be made on fallow, non-irrigated cropland if the treated areas comprise less than 10% of the immediate field in any one year. Tordon 22K should not be applied to cropland at rates exceeding 1 gallon/acre. When Tordon 22K at 1/2 to 1 gallon/acre is used, injury to small grains may result for periods up to two years after treatment.

Treated areas may be relocated more readily if marked with flags or painted stakes. A permanent record of rates of Tordon 22K and dates of treatment should be made by the grower to prevent inadvertent planting to susceptible crops before disappearance of injurious residues.

Use only on land that will be planted the following year to grass, barley, oats, wheat or fallowed. Most broadleaf crops are extremely sensitive to soil residues of Tordon 22K and should not be planted in treated areas for at least 36 months after application. A bioassay is recommended prior to planting of sensitive crops.

Small grains planted after fallow land treatment with Tordon 22K may result in yield reductions to varying degrees depending on the rate of application, soil organic matter, rainfall, temperature and incidence of cereal disease.

Allow a minimum of 45 days of soil temperatures above 40°F between application of 1/2 pint of Tordon 22K and planting. Allow a minimum of 60 days of soil temperatures above 40°F for rates greater than 1/2 pint/acre. Adequate soil moisture is critical during this period. These intervals reduce, but do not eliminate, the risk of crop injury. Growers should evaluate the benefit of weed control versus the risk of crop damage. Treat with Tordon 22K only if the risk of injury to the small grain crop can be tolerated.

Conservation Reserve Program (CRP) for Seeding to Permanent Grasses Only

Do not use Tordon 22K if legumes are a desired cover during CRP.

Conditions that stress grasses, such as drought, will increase potential for injury to the grass at all stages of growth.

To reduce potential damage to subsequent small grain crops, use the lower rate or discontinue the use of Tordon 22K at least 2 years prior to the seeding of small grain crops. After CRP, do not plant broadleaf crops in treated acres until an adequately sensitive bioassay shows that no detectable picloram is present in the soil.

Broadcast Treatment (Ground and Aerial Applications)

Applications of Tordon 22K should be made when perennial grasses have become established (has developed a good secondary root system and shows good vigor) since most perennial grasses have shown better tolerance to the herbicide at that stage.

For control of actively growing perennial weeds, use up to 1 quart/acre of Tordon 22K after the grass is established. For best results, use in 2 or more gallons of water per acre by air or in 5 or more gallons of water per acre by ground. Increasing the rate of application can increase the risk of injury.

For control of actively growing susceptible annual broadleaf weeds, (including Russian thistle) apply 1/4 to 1/2 pint/acre of Tordon 22K. Tordon 22K can also be tank mixed with 1/2 to 1 pound/acre, 2,4-D where species present are sensitive to 2,4-D. Read and follow all directions for use and use precautions on other product labels.

Spot Treatment

For spot applications when perennial grasses are established, use 1 pint to 4 quarts/acre of Tordon 22K. Rates of 2 quarts/acre or more should only be used for control of deep-rooted perennial broadleaf weeds.

Tordon 22K at rates over 1 quart/acre may suppress certain established grasses such as brome grass, blue gramma and buffalograss. However, subsequent grass growth should be improved by release from weed competition.

WARRANTY LIMITATIONS AND DISCLAIMER

DowElanco warrants that this product conforms to the chemical description on the label and is reasonably fit for the purposes stated on the label when used in strict accordance with the directions, subject to the inherent risks set forth below. DOWELANCO MAKES NO OTHER EXPRESS OR IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER EXPRESS OR IMPLIED WARRANTY.

INHERENT RISKS OF USE

It is impossible to eliminate all risks associated with use of this product. Plant injury, lack of performance, or other unintended consequences may result because of such factors as use of the product contrary to label instructions (including conditions noted on the label, such as unfavorable temperature, soil conditions, etc.), abnormal conditions (such as excessive rainfall, drought, tornadoes, hurricanes), presence of other materials, the manner of application, or other factors, all of which are beyond the control of DowElanco or the seller. All such risks shall be assumed by Buyer.

LIMITATION OF REMEDIES

The exclusive remedy for losses or damages resulting from this product (including claims based on contract, negligence, strict liability, or other legal theories), shall be limited to, at DowElanco's election, one of the following:

1. Refund of purchase price paid by buyer or user for product bought, or
2. Replacement of amount of product used.

DowElanco shall not be liable for losses or damages resulting from handling or use of this product unless DowElanco is promptly notified of such loss or damage in writing. In no case shall DowElanco be liable for consequential or incidental damages or losses.

The terms of the "Warranty Disclaimer" above and this "Limitation of Remedies" cannot be varied by any written or verbal statements or agreements. No employee or sales agent of DowElanco or the seller is authorized to vary or exceed the terms of the "Warranty Disclaimer" or this "Limitation of Remedies" in any manner.

DowElanco

Indianapolis, IN 46268, U.S.A.

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This is a specimen label. DowElanco is not responsible for the accuracy of the information contained herein. As labels are subject to revision, always read and follow label on the product container.

REVISIONS INCLUDE:

- 1) Revised "Woody Species Controlled", "Direction for Use", "Spot Treatment", "Non-Cropland Areas" and "Broadcast Treatment" Sections.
- 2) Application Rates and Comments.
- 3) Added "Spot Treatment" to "Rangeland & Permanent Pasture" Section.
- 4) Revised Use Rates for Wheat, Barley and Oats Table.
- 5) Edited directions for Fallow Cropland.

CURTAIL*

HERBICIDE

For Selective Control of Broadleaf Weeds in Wheat and Barley Not Underseeded With a Legume, Fallow Cropland, Grasses Grown for Seed And Conservation Reserve Program (CRP) Acres

ACTIVE INGREDIENT(S):

Clopyralid (3,6-Dichloro-2-pyridinecarboxylic acid) as alkanolamine salts (of the ethanol and isopropanol series) 7.5%

2,4-Dichlorophenoxyacetic Acid as alkanolamine salts (of the ethanol and isopropanol series) 38.4%

INERT INGREDIENT(S): 54.1%

TOTAL 100.0%

Acid Equivalents:

3,6-Dichloro-2-pyridinecarboxylic acid 3.9% - 0.38 lb/gal

2,4-Dichlorophenoxyacetic acid 20.9% - 2.0 lb/gal

E.P.A. Registration No. 62719-48

E.P.A. Est. 464-MI-1

KEEP OUT OF REACH OF CHILDREN

DANGER

PELIGRO:

PRECAUCIÓN AL USUARIO:

Si usted no lee inglés, no use este producto hasta que la etiqueta le haya sido explicada ampliamente.

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

CAUSES EYE DAMAGE AND SKIN IRRITATION • HARMFUL IF SWALLOWED

Do Not Get In Eyes, On Skin Or On Clothing • Wear Goggles Or Face Shield When Handling • Wash Thoroughly With Soap And Water After Handling • Remove Contaminated Clothing and Wash Before Reuse

STATEMENTS OF PRACTICAL TREATMENT:

If in eyes, flush with plenty of water for at least 15 minutes. Get medical attention. If on skin, wash with plenty of soap and water. Get medical attention if irritation persists. If swallowed, induce vomiting immediately by giving two glasses of water and sticking finger down throat. Call a physician. Do not induce vomiting or give anything by mouth to an unconscious person.

ENVIRONMENTAL HAZARDS

Keep out of lakes, streams or ponds. Do not contaminate water when disposing of equipment washwaters. Do not contaminate water used for irrigation or domestic purposes. Do not apply directly to any body of water or wetlands. See additional precautionary statements elsewhere on this label.

NOTICE

Read and understand the entire label before using. Use only according to label directions.

Before buying or using this product, read "WARRANTY LIMITATIONS AND DISCLAIMER" elsewhere on this label. If terms are not acceptable, return unopened package at once to seller for full refund of purchase price paid. Otherwise, use by the buyer or any other user constitutes acceptance of the terms under WARRANTY LIMITATIONS AND DISCLAIMER.

IN CASE OF AN EMERGENCY

endangering life or property involving this product, call collect 517-636-4400

AGRICULTURAL CHEMICAL

Do Not Ship or Store with Food, Feeds, Drugs, or Clothing

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

Do not apply this product through any type of irrigation system

CURTAIL Herbicide is recommended for selective, postemergence control of the following broadleaf weeds in wheat and barley not underseeded with a legume, fallow cropland (including summer fallow, post-harvest, and set-aside acres) and land in the Conservation Reserve Program (CRP)

alfalfa	nightshade, cutleaf
artichoke, Jerusalem	nightshade, hairy
buckwheat, wild	pennycress, field (fanweed)
buffalobur ¹	pigweed, redroot
burdock, common	
chamomile, false (scentless)	pineappleweed
chamomile, mayweed	plantain
(dogfennel)	radish, wild
clover, sweet	ragweed, common
clover, red	ragweed, giant
cocklebur, common	salsify, meadow (goatsbeard)
coffeed	shepherdspurse
cornflower (bachelor button)	sicklepod
dandelion	smartweed, Pennsylvania
dock, curly	sorrel, red
flixweed ¹	sowthistle, annual
groundsel, common	sowthistle, perennial ¹
hawksbeard, narrowleaf	starthistle, yellow
horseweed	sunflower, common
jimsonweed	tansymustard, pinnate ¹
knapweed, diffuse	thistle, Canada
knapweed, Russian ¹	thistle, musk
knapweed, spotted	thistle, Russian (1-3 leaf)
kochia (2-4 leaf) ¹	velvetleaf
ladysthumb	vetch
lambsquarters, common	volunteer beans
lettuce, prickly	volunteer lentils
locoweed, white	volunteer peas
locoweed, lambert	
marshelder	
mustard, tumble (Jim Hill)	
mustard, wild	

¹ These weeds may only be suppressed. Suppression is a visual reduction in weed competition (reduced population or vigor) as compared to untreated areas. The degree of weed control and duration of effect will vary with weed size and density, spray rate and coverage, and growing conditions before, during and after the time of treatment.

For perennial weeds, CURTAIL Herbicide will control the initial topgrowth and inhibit regrowth during the season of application (season-long control). At higher use rates shown on this label, CURTAIL Herbicide may cause a reduction in shoot regrowth in the season following application, however, plant response may be inconsistent due to inherent variability in shoot regrowth from perennial root systems.

Timing: Apply to actively growing weeds. Extreme growing conditions such as drought or near freezing temperatures prior to, at and following time of application may reduce weed control and increase the risk of crop injury at all stages of growth. Only weeds which are emerged at the time of application will be affected. Wet foliage at the time of application may decrease control. The CURTAIL Herbicide treatment will be rainfast within 6-8 hours after application.

Rate: Generally, lower labeled application rates will be satisfactory for young, succulent growth of sensitive weed species. For less sensitive species, perennials and under conditions where control is more difficult (plant stress conditions such as drought or extreme temperatures, dense weed stands and/or larger weeds) the higher rates will be needed. Weeds in fallow or other areas where crop competition is not a factor will generally require higher rates to obtain control or suppression.

Coverage: Adequate spray coverage and drift control are important. Obtaining a balance between spray coverage and drift control may sometimes be difficult but can be achieved, provided the applicator understands the factors affecting coverage and drift. Factors affecting spray coverage include spray volume, crop canopy and weed density. As crop canopy and weed density increase, spray volume should be increased to obtain equivalent weed control. Refer to manufacturer's recommendations for informa-

tion on the relationship between gallons per acre, spray pressure, sprayer speed, nozzle type and arrangement, nozzle height above the target canopy, droplet size and drift potential for respective application equipment. Do not apply less than 2 and not more than 40 gallons per acre total spray volume. For best results, apply 5 or more gallons per acre by air and 10 or more gallons per acre by ground. Reducing total spray volume may result in decreased coverage and weed control. Use enough total spray volume and a delivery system to provide thorough coverage and a uniform spray pattern. Do not apply where spray drift may be a problem due to proximity of susceptible crops or other desirable plants.

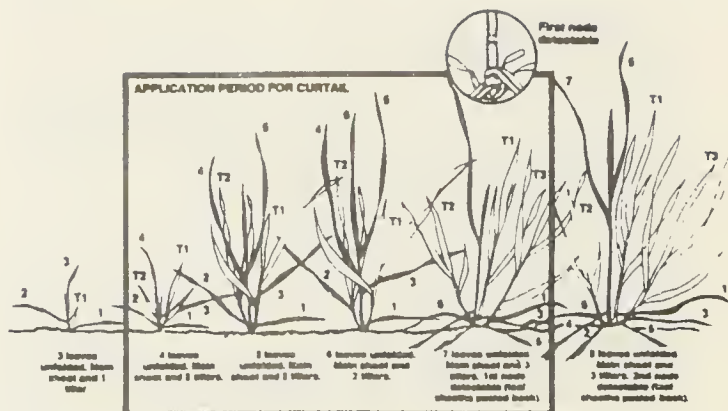
Use of Surfactants: Addition of wetting and/or penetration agents is not usually necessary when using CURTAIL Herbicide; however, if a surfactant will be added to the spray solution, use a nonionic surfactant approved for use on growing crops, such as X-77, of at least 80% active ingredient and do not exceed 4 pints per 100 gallons of spray solution (0.5% v/v). Adding a surfactant to the spray mixture may increase effectiveness on weeds but may reduce selectivity to the crop, particularly under conditions which promote plant stress.

Use With Sprayable Liquid Fertilizer Solutions: CURTAIL Herbicide is compatible with most non-pressurized liquid fertilizer solutions, however, if these solutions are to be sprayed with CURTAIL Herbicide, a compatibility test (jar test) should be made prior to mixing. Jar tests are particularly important when a new batch of fertilizer or pesticide is used, when water source changes, or when tank mixture ingredients or concentrations are changed. A compatibility test is performed by pouring the spray components (in the desired order and proportions) into a clear glass jar before mixing in the spray tank. Use of a compatibility aid such as Unite or Compex may help obtain and maintain a uniform spray solution during mixing and application. Agitation in the spray tank must be vigorous to compare with jar test agitation. For best results, liquid fertilizer rates should not exceed 50% of the total spray volume. Premix CURTAIL Herbicide with water and add to the liquid fertilizer/water mixture while agitating contents of the spray tank. Apply the spray the same day it is prepared while maintaining continuous agitation. **NOTE:** Foliar-applied liquid fertilizers can cause yellowing or leaf burn of crop foliage.

WHEAT AND BARLEY

Timing: Apply CURTAIL Herbicide in the spring to actively growing wheat or barley once 4 leaves have unfolded on the main stem and tillering has begun up to the jointing stage (first node of main stem detectable). To control or suppress weeds listed above, make application after maximum emergence of the target weeds but before they exceed 3 inches in height or diameter (for rosettes). To obtain season-long control of perennial weeds such as Canada thistle, apply after the majority of the weed's basal leaves have emerged from the soil, but before bud state. A later timing of application (when the grain is between the jointing and boot stages) may be used to treat later-emerging weeds, however, do not apply unless the risk of injury is acceptable. Do not apply after the boot stage. **NOTE:** Do not permit dairy animals or meat animals being finished for slaughter to forage or graze treated grain fields within 1 week after treatment. Do not harvest hay from treated grain fields.

Rate: Apply 2 to 2½ pints of CURTAIL Herbicide per acre. The higher rate may be used when the condition of the weeds and/or crop at the time of treatment may prevent optimum control. **Note:** Higher rates of CURTAIL Herbicide or CURTAIL Herbicide applications following spring postemergence treatments with 2,4-D or MCPA may increase the risk of crop injury.



TANK MIXTURES FOR WHEAT AND BARLEY

This product may be tank mixed with the following herbicides for control of additional weeds in wheat and barley. Read and follow the label of each tank mix product used for precautionary statements, directions for use, weeds controlled and geographic and other restrictions. When tank mixing, use in accordance with the most restrictive of label limitations and precautions. No label dosages should be exceeded. This product cannot be mixed with any product containing a label prohibition against such mixing.

Active Ingredient	Product	Formulation	Amount of Product Per Acre
bromoxynil ¹	Buctril	2 lb/gal	¼ to 1 pt
	Buctril 4EC	4 lb/gal	¼ to ½ pt
	Buctril ME4		
chlorsulfuron	Glean	75% DF	¼ to ¼ wt oz
dicamba ^{1,2}	Banvel	4 lb/gal	¼ to ¼ pt
diflufeniquin	Avenge	2 lb/gal	2½ to 4 pt
diuron	Direx 4L	4 lb/gal	1 to 1½ pt
	Diuron 4L		
	Diuron 80 WDG	80% DF	½ to 1 lb
MCPA or 2,4-D ²	Diuron DF	80% WP	
		4 lb/gal	Up to ½ pt
	Lexone DF	75% DF	2½ to 4 wt oz
metsulfuron methyl	Ally	60% DF	¼ to ¼ wt oz
	Igran 80 WR	80% WP	6 to 10 wt oz
	Harmony	75% DF	½ to ½ wt oz
	Express	75% DF	¼ to ¼ wt oz

¹ Buctril or Banvel tank mixes with CURTAIL Herbicide may be useful in broadening the annual weed control spectrum but may reduce control of perennials, such as Canada thistle.

² Note: Do not tank mix CURTAIL Herbicide with 2,4-D or dicamba unless the risk of crop injury is acceptable.

FALLOW CROPLAND

Timing: CURTAIL Herbicide can be applied either postharvest, in the spring/summer (during fallow period) or to set-aside acres to control or suppress weeds listed above (refer to rotation restrictions). Apply to young, emerged weeds under conditions that promote active growth. For best results on tough perennial weeds such as Canada thistle, apply after the majority of the basal leaves have emerged, but before bud stage. Later applications may result in less consistent control. Extreme growing conditions (such as drought or near freezing temperatures) prior to, at, and following the time of application may reduce weed control.

For best results, wait 14 to 20 days after application before cultivating or fertilizing with shank-type applicators to allow for thorough translocation. To avoid potential phytotoxicity, allow at least 20 days after the application before seeding to wheat, barley or grasses.

Rate: Apply 2 to 4 pints of CURTAIL Herbicide per acre. Use the higher rate on perennial weeds or when the condition of the weeds at the time of treatment may prevent optimum control.

Tank Mixtures For Fallow Cropland: To improve control of certain broadleaf weeds, CURTAIL Herbicide at 2 pints per acre may be applied with up to 1.5 lb ae per acre additional 2,4-D. When mixing, read and follow the label of each tank mix product used for precautionary statements, directions for use, weeds controlled and geographic and other restrictions. When tank mixing, use in accordance with the most restrictive of label limitations and precautions. No label doses should be exceeded. This product cannot be mixed with any product containing a label prohibition against such mixing.

GRASSES GROWN FOR SEED

Timing: Apply only to established grasses before the boot stage. Applications in the boot stage and beyond will result in increased injury. Do not apply to bentgrass unless injury can be tolerated.

Rate: Use 2 to 4 pints of CURTAIL Herbicide per acre for control of annual weeds and Canada thistle. The potential for crop injury exists due to the 2,4-D component of this product and must be balanced against the benefits of improved weed control. Potential for crop injury increases with higher rates. Re-treat as necessary, but do not exceed 4 pints per acre of CURTAIL per season.

Note: Do not graze (dairy) cattle in treated areas for 14 days after application. Remove meat animals from freshly treated areas for 7 days before slaughter. Withdrawal is not needed if 2 weeks or more have elapsed since application. Do not cut treated grass for hay within 30 days after application.

CONSERVATION RESERVE PROGRAM (CRP) FOR SEEDING TO PERMANENT GRASSES ONLY

Do not use CURTAIL Herbicide if legumes or bentgrass are a desired cover during CRP.

Grass grown on CRP acres cannot be grazed or used for hay.

Conditions that stress grasses, such as drought, will increase potential for injury to the grass at all stages of growth. Do not use in newly seeded areas until grass is established.

Timing: CURTAIL Herbicide can be applied when perennial grasses have become established (tillering, with at least 1.5 inches secondary roots, and good vigor). For control of weeds such as musk thistle, Canada thistle and knapweed (diffuse, spotted and Russian), apply to actively growing weeds after the majority of the basal leaves have emerged, but before bud stage. Later applications may result in less consistent control.

Rate: Apply 2 to 5 quarts of CURTAIL Herbicide per acre.

USE PRECAUTIONS

Apply only once per 12-month period, except for grass grown for seed (see Directions for Use). A fallow treatment that precedes or follows a small grain application is also allowed.

This product can affect susceptible broadleaf plants directly through foliage and indirectly by root uptake from treated soil. Therefore, do not apply CURTAIL Herbicide directly to or allow spray drift to come in contact with vegetables, flowers, grapes, tomatoes, potatoes, beans, lentils, peas, alfalfa, sunflowers, soybeans, safflower, or other desirable broadleaf crops and ornamental plants or soil where these sensitive crops will be planted the same season.

Do not contaminate irrigation ditches or water used for irrigation or domestic purposes.

Wheat, barley, oats, grasses, or sugar beets (including beets grown for seed) may be planted less than 12 months after treatment.

Alfalfa, asparagus, canola, cole crops, mint, onions, safflower, and strawberries may be planted 12 months after treatment. Dry beans, soybeans and sunflowers may also be planted at 12 months after treatment, except in soils with less than 2% organic matter receiving less than 15 inches of natural precipitation in the 12 month period following treatment. For these areas see SPECIAL CONDITIONS below.

To avoid potential phytotoxicity all other crops including peas, lentils, potatoes, and broadleaf crops grown for seed should not be planted for 18 months after treatment unless the risk of injury is acceptable.

SPECIAL CONDITIONS: CURTAIL residues in plant tissues which have not completely decayed may affect succeeding susceptible crops. In areas defined previously as low in organic matter and precipitation, sensitive crops such as dry beans, soybeans, and sunflowers may be injured when planted 12 months after treatment. Unless the risk of injury is acceptable, these crops should not be planted until 18 months after treatment. The potential for injury may be reduced by burning, removal, or incorporation of treated crop residues with a minimum of 2 supplemental Fall irrigations.

Avoid Spray Drift: Applications should be made to avoid spray drift since very small quantities of the spray, which may not be visible, may severely injure susceptible crops during both growing and dormant periods. Use coarse sprays to minimize drift since, under adverse weather conditions, fine spray droplets may drift a mile or more. Fine droplets can present a drift hazard. A drift control or deposition agent such as Nalco-Trol may be used with this product to aid in reducing spray drift. If used, follow all use recommendations and precautions on the product label.

Ground Application: To minimize spray drift, apply CURTAIL Herbicide in a total spray volume of 10 or more gallons per acre as a large-droplet, low pressure spray. Refer to manufacturer's recommendations for additional information on gallons per acre, spray pressure, sprayer speed, nozzle types and arrangements, nozzle heights above the target canopy, etc., for respective application equipment. Spot treatments should only be applied with a calibrated boom to prevent misapplication. With ground equipment, spray drift can be lessened by keeping the spray boom as low as possible; by applying no more than 20 gallons of spray per acre; by using no more than 30 pounds spraying pressure with large droplet-producing nozzle tips; by spraying when wind velocity is low; and by stopping all spraying when wind exceeds 6 to 7 miles per hour. Do not apply with hollow cone-type insecticide or other nozzles that produce a fine-droplet spray.

Aerial Application: With aircraft, drift can be lessened by applying a coarse spray; by using no more than 30 pounds spray pressure at the nozzles; by using straight-stream nozzles directed straight back; by using a spray boom no longer than $\frac{3}{4}$ the wing span of the aircraft; and by spraying only when wind velocity is less than 6 mph.

Do Not Apply By Aircraft When An Air Temperature Inversion Exists. Such a condition is characterized by little or no wind and with lower air temperature near the ground than at higher levels. The use of a smoke device on the aircraft or continuous smoke column at or near site of application will indicate air direction and velocity, and whether a temperature inversion is present, which is shown by layering of the smoke.

Do not move treated soil and avoid situations where treated soil particles may blow into areas where susceptible crops are grown. Violent windstorms may move soil particles. If this product is on soil particles and they are blown onto susceptible plants, visible symptoms may appear. Serious injury is unlikely. The hazard of movement of this product on dust is reduced if treated fields are irrigated or if rain occurs shortly after application.

Straw from treated areas, or manure from animals which have grazed treated areas, cannot be used for composting or mulching on ground where susceptible crops may be grown the following season. To promote herbicide decomposition, plant material should be evenly incorporated or burned.

Do not use in a greenhouse. Excessive amounts of this herbicide in the soil may temporarily inhibit seed germination or plant growth.

Do not contaminate water when disposing of equipment washwaters. Apply this product only as specified on this label.

Do not transfer livestock from treated grazing areas onto sensitive broadleaf crop areas without first allowing 7 days of grazing on an untreated pasture. Otherwise, urine may contain enough clopyralid to cause injury to sensitive broadleaf plants.

PRECAUTIONARY STATEMENTS

ENVIRONMENTAL HAZARDS

Clopyralid is a chemical which can travel (seep or leach) through soil and under certain conditions contaminate groundwater which may be used for

irrigation or drinking purposes. Users are advised not to apply clopyralid where soils have a rapid to very rapid permeability throughout the profile (such as loamy sand to sand) and the water table of an underlying aquifer is shallow, or to soils containing sinkholes over limestone bedrock, severely fractured surfaces, and substrates which would allow direct introduction into an aquifer. Your local agricultural agencies can provide further information on the type of soil in your area and the location of groundwater.

STORAGE AND DISPOSAL

Do not contaminate water, food or feed by storage or disposal.

Storage: Store above 10°F or warm and agitate before use.

Pesticide Disposal: Pesticide wastes are toxic. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of Federal Law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste representative at the nearest EPA Regional Office for guidance.

Container Disposal (Metal): Do not reuse container. Triple rinse (or equivalent). Puncture and dispose of in a sanitary landfill, or by other procedures approved by state and local authorities.

Container Disposal (Plastic): Do not reuse container. Triple rinse (or equivalent). Puncture and dispose of in a sanitary landfill, or by incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

WARRANTY LIMITATIONS AND DISCLAIMER

DowElanco warrants that this product conforms to the chemical description on the label and is reasonably fit for the purposes stated on the label when used in strict accordance with the directions therein under normal conditions of use. THIS IS THE ONLY WARRANTY MADE ON THIS

PRODUCT. NO OTHER EXPRESS AND NO IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE IS MADE OUTSIDE OF THIS LABEL. Therefore, neither this warranty nor any other warranty of merchantability or fitness for a particular purpose, express or implied, extends to the use of this product contrary to label instructions (including conditions noted on the label, such as unfavorable temperatures, soil conditions, etc.), under abnormal conditions (such as excessive rainfall, drought, tornadoes, hurricanes, etc.) or under conditions not reasonably foreseeable to or beyond the control of seller.

When buyer or user suffers losses or damages resulting from the use or handling of this product (including claims based on contract, negligence, strict liability, or other legal theories), buyer or user must promptly notify in writing DowElanco of any claims to be eligible to receive either remedy given below. The EXCLUSIVE REMEDY OF THE BUYER OR USER and the LIMIT OF LIABILITY of DowElanco or any other seller will be one of the following, at the election of DowElanco:

- (1) Refund of purchase price paid by buyer or user for product bought, or
- (2) Replacement of amount of product used.

The seller will not be liable for consequential or incidental damages or losses.

The terms of this Warranty Limitations And Disclaimer cannot be varied by any written or verbal statements or agreements. Any employee or sales agent of the seller is not authorized to vary or exceed the terms of this Warranty Limitations And Disclaimer in any manner.

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This is a specimen label. DowElanco is not responsible for the accuracy of the information contained herein. As labels are subject to revision, always carefully read and follow the label on the product container.

STINGER*

HERBICIDE

For Selective Postemergence Control of Broadleaf Weeds in Sugar Beets, Field Corn, Wheat, Barley and Oats Not Underseeded With a Legume, Christmas Tree Plantations and Nurseries, Grasses Grown for Seed, Fallow Cropland, Rangeland and Permanent Grass Pastures, Non-Cropland Areas, and Conservation Reserve Program (CRP) Acres

Active Ingredient(s):

Clopyralid (3,6-dichloro-2-pyridinecarboxylic acid)	
as the monoethanolamine salt	40.9%
Inert Ingredient(s):	59.1%
TOTAL	100%

ACID EQUIVALENT: 3,6-dichloro-2-pyridinecarboxylic acid, 31%- 3lb/gal

E.P.A. Registration No. 62719-73

E.P.A. Est. 464-MI-1

KEEP OUT OF REACH OF CHILDREN

CAUTION

PRECAUTION:

PRECAUCION AL USUARIO: Si usted no lee inglés, no use este producto hasta que la etiqueta le haya sido explicada ampliamente.

PRECAUTIONARY STATEMENTS

Hazards to Humans and Domestic Animals

CAUSES EYE INJURY • HAMFUL IF INHALED OR ABSORBED THROUGH SKIN

Avoid Contact With Eyes, Skin Or Clothing • Avoid Breathing Spray Mist • Wash Thoroughly With Soap And Water After Handling • Remove Contaminated Clothing And Wash Before Reuse

STATEMENTS OF PRACTICAL TREATMENT:

If In eyes, flush with plenty of water. Get medical attention if irritation persists. If on skin, wash with plenty of soap and water. Get medical attention.

PHYSICAL OR CHEMICAL HAZARDS

COMBUSTIBLE • Do Not Use or Store Near Heat or Open Flame. • Do Not Cut or Weld Container.

ENVIRONMENTAL HAZARDS

Do not contaminate water when disposing of equipment washwaters. Do not contaminate water used for irrigation or domestic purposes. Do not apply directly to any body of water or wetlands. See additional precautionary statements elsewhere on this label.

NOTICE

Read and understand the entire label before using. Use only according to label directions.

Before buying or using this product, read "WARRANTY LIMITATIONS AND DISCLAIMER" elsewhere on this label. If terms are not acceptable, return unopened package at once to seller for full refund of purchase price paid. Otherwise, use by the buyer or any other user constitutes acceptance of the terms under WARRANTY LIMITATIONS AND DISCLAIMER.

IN CASE OF AN EMERGENCY endangering life or property involving this product, call collect 517-636-4400

AGRICULTURAL CHEMICAL

Do Not Shlp Or Store with Food, Feeds, Drugs, or Clothing

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

Do not apply this product through any type of irrigation system.

STINGER Herbicide is recommended for selective, postemergence control of the following broadleaf weeds in sugar beets, field corn, wheat, barley, and oats not underseeded with a legume, fallow cropland, rangeland and permanent grass pastures, grasses grown for seed, Christmas trees, conservation reserve program (CRP) acres, and non-cropland areas including fence rows, around farm buildings, and equipment pathways.

artichoke, Jerusalem	marshelder
buckwheat, wild	nightshade, Eastern black
buffalobur ¹	nightshade, cutleaf
burdock, common	nightshade, hairy
chamomile, false (scentless)	oxeye daisy
chamomile, mayweed	pineappleweed
(dogfennel)	ragweed, common
clover, sweet	ragweed, giant
clover, red	salsify, meadow
cocklebur, common	(goatsbeard)
coffeed	sicklepod
cornflower (bachelor button)	smartweed, green ¹
dandelion	sorrel, red
dock, curly	sowthistle, annual
groundsel, common	sowthistle, perennial ¹
hawksbeard, narrowleaf	starthistle, yellow
horseweed	sunflower
jimsonweed	thistle, Canada
knapweed, diffuse	thistle, musk
knapweed, Russian ¹	vetch
knapweed, spotted	volunteer alfalfa
ladysthumb ¹	volunteer beans
lettuce, prickly	volunteer lentils
locoweed, white	volunteer peas
locoweed, lambert	

¹ These weeds may only be suppressed. Suppression is a visual reduction in weed competition (reduced population or vigor) as compared to untreated areas. The degree of weed control and duration of effect will vary with weed size and density, spray rate and coverage, and growing conditions before, during, and after the time of treatment. For perennial weeds, STINGER Herbicide will control the initial topgrowth and inhibit regrowth during the season of application (season-long control). At higher use rates shown on this label, STINGER Herbicide may cause a reduction in shoot regrowth in the season following application; however, plant response may be inconsistent due to inherent variability in shoot regrowth from perennial root systems.

Timing: Apply to actively growing weeds. Extreme growing conditions such as drought or near freezing temperatures prior to, at, and following time of application may reduce weed control and increase the risk of crop injury at all stages of growth. **Only weeds which are emerged at the time of application will be affected.** Wet foliage at the time of application may decrease control. The treatment with STINGER Herbicide will be rainfast within 6-8 hours after application.

Rate: Generally, lower labeled application rates will be satisfactory for young, succulent growth of sensitive weed species. For less sensitive species, perennials, and under conditions where control is more difficult (plant stress conditions such as drought or extreme temperatures, dense weed stands, and/or larger weeds), the higher rates will be needed. Weeds in fallow or other areas where crop competition is not a factor will generally require higher rates to obtain control or suppression.

Coverage: Adequate spray coverage and drift control are important. Obtaining a balance between spray coverage and drift control may sometimes be difficult but can be achieved provided the applicator understands the factors affecting coverage and drift. Factors affecting spray coverage include spray volume, crop canopy, and weed density. As crop canopy and weed density increase, spray volume should be increased to obtain equivalent weed control. Refer to manufacturer's recommendations for information on the relationship between gallons per acre, spray pressure, sprayer speed, nozzle type and arrangement, nozzle height above the target canopy, droplet size, and drift potential for respective application equipment. Use equipment and nozzle types which are designed for herbicide application. Do not apply less than 2 and not more than 40 gallons per acre total spray volume. For best results, apply 5 or more gallons per acre by air and 10 or more gallons per acre by ground. Reducing total spray volume may result in decreased coverage and weed control. Use enough total spray volume and a delivery system to provide thorough coverage and a uniform

spray pattern. Do not apply where spray drift may be a problem due to proximity of susceptible crops or other desirable plants.

Use of Adjuvants: Addition of surfactants, crop oils, or other adjuvants is not usually necessary when using STINGER Herbicide. Adding a surfactant to the spray mixture may increase effectiveness on weeds but may reduce selectivity to the crop, particularly under conditions which promote plant stress. If an adjuvant is added to the spray solution, follow all manufacturer use guidelines.

Tank Mixes: When tank mixing, read and follow the label of each tank-mix product used for precautionary statements, directions for use, weeds controlled, and geographic and other restrictions. Use in accordance with the most restrictive of label limitations and precautions. No label dosages should be exceeded. This product cannot be mixed with any product containing a label prohibition against such mixing.

WEED CONTROL GUIDELINES ¹ Amount of STINGER Per Acre X Use Site ²							
Weed Species	Growth Stage	Sugar Beet, Christmas Trees	Wheat, Barley, Oats	Grasses For Seed	Fallow, Non-Crop	Range & Pasture, CRP	Field Corn
clover cocklebur sunflower ragweeds jimsonweed volunteer soybean vetch marshelder	Up to 5 leaf	1/4-1/2 pt	1/4-1/2 pt	1/4-1/2 pt	1/4-1/2 pt	1/4-2/3 pt	1/4-1/2 pt
wild buckwheat nightshade sp. buffalobur smartweeds (suppression)	1-3 leaf stage, but before vining 2-4 leaf 2-3 leaf	1/2 pt					
Canada thistle sowthistle (suppression) knapweeds, spotted/diffuse knapweeds, Russian (suppression)	rosette to prebud up to bud stage	1/2-2/3 pt 2/3 pt	1/4-1/2 pt —	1/2-2/3 pt 2/3-1 pt	1/2 pt —	2/3-1 pt 2/3-1 pt 1-1 1/2 pt	1/2-2/3 pt — —

¹ This table is intended as a reference only. For complete instructions see the body of the text.
² Use the lower rate for light to moderate infestations and good growing conditions and the higher rate for dense infestations or under poor growing conditions such as drought.

Sugar Beets STINGER Herbicide is recommended for the control of various annual and perennial broadleaf weeds infesting sugar beets. Apply 1/4 to 2/3 pint of STINGER Herbicide per acre with ground equipment as a broadcast foliar spray. Apply in 10 or more gallons total spray volume per acre when the sugar beets are in the cotyledon to 8 leaf stage of growth and the weeds are young and actively growing. Re-treat as necessary but do not exceed 2/3 pint of STINGER Herbicide per acre per season. Do not apply within 105 days before harvest of beet roots and tops. Do not apply to sugar beets grown for seed.

STINGER Herbicide may be applied as a band treatment. Use the formulas below to determine the appropriate rate and volume per treated acre.

$$\frac{\text{Band width in inches}}{\text{Row width in inches}} \times \text{Broadcast rate per treated acre} = \text{Band rate per treated acre}$$

$$\frac{\text{Band width in inches}}{\text{Row width in inches}} \times \text{Broadcast volume per treated acre} = \text{Band volume per treated acre}$$

For annual weed control spray 1/4 - 1/2 pt of STINGER Herbicide per acre on weeds up to the 5 leaf growth stage. Wild buckwheat applications should be made at the 1-3 leaf stage, before vining begins.

For the most effective control of perennials such as Canada thistle and sowthistle, apply 1/2 - 2/3 pint of STINGER Herbicide per acre as a broadcast treatment to the entire infested area. Apply when the majority of basal leaves have emerged, but before the bud stage. Cultivation can disrupt translocation to the roots of perennials such as Canada thistle. For best results do not cultivate thistle patches.

To promote herbicide efficacy wait a minimum of 7 days after application before flood or furrow irrigation.

Tank Mixes: To control additional broadleaf weeds and provide consistent control of difficult weeds such as wild buckwheat, tank mix 1/4 - 2/3 pint of STINGER Herbicide per acre with 2-6.5 pints of Betamix or Betanex. For best results, apply 1/4 pint of STINGER tank mixed with 2-6.5 pints of Betamix or Betanex followed 1-2 weeks later by a second application of 1/4 - 1/2 pint of STINGER per acre tank mixed with Betamix or Betanex. Note: Do not add additional adjuvants when employing a Betamix or Betanex tank mix with STINGER Herbicide due to increased potential for crop injury. (See tank mix section under Directions for Use.)

STINGER Herbicide may be tank mixed with grass herbicides such as Poast for grassy weed control. Be sure to include crop oil or Dash surfactant to optimize grass weed control. (See tank mix section under Directions for Use.)

Field Corn

STINGER Herbicide is recommended for postemergence control of Canada thistle, Jerusalem artichoke, annual sowthistle, common sunflower, common cocklebur, giant and common ragweed, jimsonweed and other broadleaf weeds infesting field corn. Apply STINGER Herbicide at suggested timing and rates for field corn as indicated below.

Apply STINGER Herbicide to actively growing broadleaf weeds any time after corn emergence through 24 inch tall corn. Apply with ground equipment as a postemergence broadcast or directed spray in 10 or more gallons of spray volume per acre to ensure uniform and thorough spray coverage of the weed foliage. Use only spray nozzles designed for herbicide application. The use of flat fan nozzles provides the best coverage and distribution of chemical on the plant foliage. Use spray pressures (at the boom) which

nozzle manufacturers recommend to obtain desired spray volume. Use higher spray pressures and volumes when weed foliage is dense.

For the most effective control of Canada thistle, apply $\frac{1}{4}$ to $\frac{1}{2}$ pint of STINGER Herbicide per acre as a broadcast treatment to the entire infested area. Apply when the majority of the basal leaves have emerged, thistles are at least 4 inches in diameter or height, but before bud stage. Use the higher rate listed for dense patches or when greater residual control is desired. Cultivation can disrupt translocation to the roots of Canada thistle. For best results, do not cultivate prior to application, and wait 14 to 20 days after application before cultivating to allow for thorough translocation.

For control of common cocklebur, giant ragweed, common ragweed, sunflower, other annual weeds and Jerusalem artichoke, apply $\frac{1}{4}$ to $\frac{1}{2}$ pint of STINGER Herbicide on weeds up to the 5 leaf stage.

Hand-Held Sprayers - Applications should be made on a spray-to-wet basis with spray coverage uniform and complete. Do not spray to the point of runoff. Prepare the desired volume of spray solution by mixing the amount of STINGER Herbicide with water as shown in the following table.

Desired Volume Spray Solution	Amount of STINGER
1 gallon	$\frac{1}{4}$ fl. ounce
25 gallons	$\frac{1}{2}$ pint
100 gallons	1 $\frac{1}{2}$ pints

Restrictions: Re-treat as necessary, but do not apply more than $\frac{2}{3}$ pint of STINGER Herbicide per acre per year. Do not apply to field corn greater than 24 inches tall. Do not allow livestock to graze treated areas or harvest treated corn silage as feed within 40 days after last treatment.

Christmas Tree Plantations And Nurseries

Timing: STINGER Herbicide can be safely applied over the top of actively growing: balsam fir, blue spruce, Douglas fir, Frazer fir, grand fir, lodgepole pine, noble fir, ponderosa pine, Scotch pine, and white pine. For the Pacific Northwest do not apply in the first year of transplanting. Apply only to trees transplanted at least one year. (Some needle curling has been observed on 1st year transplants.) Apply to actively growing weeds. For control of annual weeds apply STINGER Herbicide up to the 5 leaf growth stage (for wild buckwheat application at 3-5 leaf, but before vining, is recommended). For control of weeds such as Canada thistle and knapweeds, apply after the majority of the basal leaves have emerged, but before bud stage. Later application may result in less consistent control.

Rate: Apply $\frac{1}{4}$ - $\frac{1}{2}$ pint of STINGER Herbicide per acre for control of annual weeds. Apply $\frac{1}{2}$ - $\frac{2}{3}$ pint of STINGER Herbicide per acre for difficult to control weeds such as Canada thistle and knapweeds. Apply as a broadcast or band application in a minimum of 10 gallons per acre by ground application. Use the formula under "sugar beets" to determine the appropriate rate and volume per treated acre. Apply as often as needed, but do not exceed $\frac{2}{3}$ pint per acre. Do not exceed $\frac{1}{2}$ pint per acre for blue spruce. Tree injury may occur with the addition of a surfactant or crop oil with STINGER Herbicide. Do not use unless previous experience shows injury is tolerable.

Grasses Grown For Seed

Timing: Apply only to established grasses before the boot stage. Applications in the boot stage and beyond can result in increased injury. Do not apply to bentgrass unless injury can be tolerated.

Rate: Use $\frac{1}{4}$ to $\frac{2}{3}$ pint of STINGER Herbicide per acre for control of annual weeds and Canada thistle. Re-treat as necessary, but do not exceed $\frac{2}{3}$ pint of STINGER per acre per season.

Fallow Cropland

Timing: STINGER Herbicide can be applied either postharvest, in the spring/summer (during fallow period), or to set-aside acres to control or suppress weeds listed above (refer to rotation restrictions). Apply to young, emerged weeds under conditions that promote active growth. For best results on perennial weeds such as Canada thistle, apply after the majority of the basal leaves have emerged, but before bud stages. Later appli-

cations may result in less consistent control. Extreme growing conditions (such as drought or near freezing temperatures) prior to, at, and following the time of application may reduce weed control.

For best results, wait 14 to 20 days after application before cultivating or fertilizing with shank-type applicators to allow for thorough translocation.

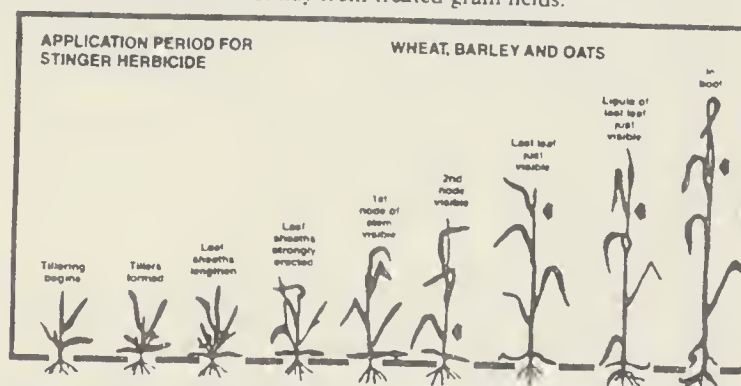
Rate: Apply $\frac{1}{4}$ to $\frac{1}{2}$ pint of STINGER Herbicide per acre. Use the higher rate on perennial weeds or when the condition of the weeds at the time of treatment may prevent optimum control.

Tank Mixtures for Fallow Cropland: To improve control of certain broadleaf weeds, STINGER Herbicide may be applied with 0.5-2.0 lb ae per acre 2,4-D.

Non-Cropland

For use on non-cropland areas such as fencerows, around farm buildings and equipment pathways. For control of broadleaf weeds, apply $\frac{1}{4}$ to $1\frac{1}{2}$ pints of STINGER Herbicide per acre. The lower rate of $\frac{1}{4}$ pint per acre provides acceptable control of weeds only under highly favorable growing conditions and when plants are 1-3 inches tall. Apply $\frac{1}{2}$ pint per acre when weeds are 3 to 6 inches tall or under dry conditions. Where Canada thistle or knapweeds are the primary pest, best results are obtained by applying $\frac{2}{3}$ to $1\frac{1}{3}$ pints of STINGER Herbicide per acre. To improve spectrum of activity or to increase activity against taller weeds, STINGER may be tank mixed with 0.5 to 2.0 lbs. ae per acre of 2,4-D amine or low volatile ester.

Wheat, Barley and Oats Apply $\frac{1}{4}$ to $\frac{1}{3}$ pint of STINGER Herbicide per acre from the 3 leaf stage up to early boot stage of growth. For control of perennial weeds such as Canada thistle, $\frac{1}{3}$ pint of STINGER Herbicide per acre should be used. Russian knapweed will only be suppressed at this rate. **NOTE:** Do not permit dairy animals or meat animals being finished for slaughter to forage or graze treated grain fields within 1 week after treatment. Do not harvest hay from treated grain fields.



Tank Mixtures for Wheat, Barley and Oats: Tank mix $\frac{1}{4}$ to $\frac{1}{3}$ pint per acre of STINGER Herbicide with the herbicides listed below for the control of additional weeds.

Active Ingredient	Product	Formulation	Amount of Product Per Acre
bromoxynil	Buctril	2 lb/gal	$\frac{1}{4}$ to 1 pt
	Buctril 4EC	4 lb/gal	$\frac{1}{4}$ to $\frac{1}{2}$ pt
	Buctril ME4		
chlorsulfuron	Glean	75% DF	$\frac{1}{8}$ to $\frac{1}{4}$ wt oz
dicamba	Banvel	4 lb/gal	$\frac{1}{4}$ to $\frac{1}{2}$ pt
diuron	Direx 4L	4 lb/gal	$\frac{1}{4}$ to $1\frac{1}{4}$ pt
	Diuron 4L		
	Diuron 80 WDG	80% DF	$\frac{1}{2}$ to 1 lb
MCPA or 2,4-D ¹	Diuron DF	80% WP	
		4 lb/gal	$\frac{1}{2}$ to 1 pt
metribuzin	Lexone DF	75% DG	
	Sencor DF		2 $\frac{1}{2}$ to 4 wt oz
metasulfuron			
metol	Ally	60% DF	$\frac{1}{10}$ wt oz
terbutryn	Igran 80WP	80% WP	7.5 to 12.5 wt oz
thiameturon	Harmony	75% DF	$\frac{1}{4}$ to $\frac{1}{2}$ wt oz
	Express	75% DF	$\frac{1}{4}$ to $\frac{1}{2}$ wt oz

¹ Tank mix with 2,4-D for application on wheat and barley only

Rangeland and Permanent Grass Pastures: Apply $\frac{2}{3}$ to $1\frac{1}{3}$ pints of STINGER Herbicide per acre when weeds are young and actively growing. Grasses are tolerant, but new grass seedlings may be injured to varying degrees until the grass has become well established.

NOTE: Some forbs are susceptible to STINGER Herbicide. Do not spray pastures containing desirable forbs, especially legumes, unless injury can be tolerated. However, the stand and growth of established perennial grasses is usually improved after spraying, especially when rainfall is adequate and grazing is deferred.

Do not use hay or straw from treated areas for composting or mulching on susceptible broadleaf crops.

Conservation Reserve Program (CRP) For Seeding To Permanent Grasses Only

Do not use STINGER Herbicide if legumes or bentgrass are a desired cover during CRP.

Grass grown on CRP acres cannot be grazed or used for hay.

Conditions that stress grasses, such as drought, will increase potential for injury to the grass at all stages of growth. Do not use in newly seeded areas until grass is established.

After CRP, do not plant broadleaf crops in treated areas until an adequately sensitive bioassay shows that no detectable clopyralid is present in the soil.

Broadcast Applications (Ground): Applications of STINGER Herbicide should be made when perennial grasses have become established (has tillered, developed a good secondary root system and shows good vigor) since most perennial grasses have shown better tolerance to the herbicide at that stage.

For control of actively growing weeds such as musk thistle, Canada thistle, and knapweed (spotted, diffuse and Russian), use $\frac{2}{3}$ to $1\frac{1}{3}$ pints per acre of STINGER Herbicide after the majority of basal leaves have emerged, but before bud stage. For the control of wild buckwheat, volunteer sunflower and musk thistle rosettes, apply $\frac{2}{3}$ pint per acre of STINGER Herbicide. STINGER Herbicide can also be tank mixed with $\frac{1}{3}$ to 1 lb/acre of 2,4-D where species present are sensitive to 2,4-D. For best results, use in 10 or more gallons of water per acre by ground. Increasing the rate of application can increase the risk of injury. Application prior to the flowering stage is recommended (still in the bud stage).

USE PRECAUTIONS

Apply only once per 12 month period, except for sugar beets, field corn and grasses grown for seed. A fallow treatment that precedes or follows a small grain application is also allowed. (see Directions for Use.)

Wheat, barley, oats, grasses, field corn or sugar beets (including beets grown for seed) may be planted at anytime following treatment.

Alfalfa, asparagus, canola, cole crops, mint, onions, safflower, and strawberries may be planted 12 months after treatment. Dry beans, soybeans, and sunflowers may also be planted at 12 months after treatment, except in soils with less than 2% organic matter receiving less than 15 inches of natural precipitation in the 12 month period following treatment. For these areas see SPECIAL CONDITIONS below.

To avoid potential phytotoxicity, all other crops, including peas, lentils, potatoes, and broadleaf crops grown for seed, should not be planted for 18 months after treatment unless the risk of injury is acceptable.

SPECIAL CONDITIONS: Residues of STINGER in plant tissues which have not completely decayed may affect succeeding susceptible crops. In areas defined previously as low in organic matter and precipitation, sensitive crops such as dry beans, soybeans, and sunflowers may be injured when planted 12 months after treatment. Unless the risk of injury is acceptable, these crops should not be planted until 18 months after treatment. The potential for injury may be reduced by burning, removal, or incorporation of treated crop residues with a minimum of 2 supplemental Fall irrigations.

This product can affect susceptible broadleaf plants directly through foliage and indirectly by root uptake from treated soil. Therefore, do not apply STINGER Herbicide directly to or allow spray drift to come in

contact with vegetables, flowers, grapes, tomatoes, potatoes, beans, lentils, peas, alfalfa, sunflowers, soybeans, safflower, or other desirable broadleaf crops and ornamental plants or soil where these sensitive crops will be planted the same season.

Do not contaminate irrigation ditches or water used for irrigation or domestic purposes.

Avoid Spray Drift: Applications should be made to avoid spray drift since very small quantities of the spray, which may not be visible, may severely injure susceptible crops during both growing and dormant periods. Use coarse sprays to minimize drift since, under adverse weather conditions, fine spray droplets may drift a mile or more. A drift control or deposition agent such as Nalco-Trol may be used with this product to aid in reducing spray drift. If used, follow all use recommendations and precautions on the product label.

Ground Application: To minimize spray drift, apply STINGER Herbicide in a total spray volume of 10 or more gallons per acre as large-droplet, low-pressure spray. Refer to manufacturer's recommendations for additional information on gallons per acre, spray pressure, sprayer speed, nozzle types and arrangements, nozzle heights above the target canopy, etc., for respective application equipment. Spot treatments should only be applied with a calibrated boom to prevent misapplication. With ground equipment, spray drift can be lessened by keeping the spray boom as low as possible; by applying no more than 20 gallons of spray per acre; by using no more than 30 pounds spraying pressure with large droplet-producing nozzle tips; by spraying when wind velocity is low; and by stopping all spraying when wind exceeds 6 to 7 miles per hour. Do not apply with hollow cone-type insecticide or other nozzles that produce a fine-droplet spray.

Do not apply by aircraft.

Do Not Transfer Livestock from treated grazing areas onto sensitive broadleaf crop areas without first allowing 7 days of grazing on an untreated pasture. Otherwise, urine may contain enough clopyralid to cause injury to sensitive broadleaf plants.

Do not move treated soil and avoid situations where treated soil particles may blow into area where susceptible crops are grown. Violent windstorms may move soil particles. If this product is on soil particles and they are blown onto susceptible plants, visible symptoms may appear. Serious injury is unlikely. The hazard of movement of this product on dust is reduced if treated fields are irrigated or if rain occurs shortly after application.

Straw from treated areas, or manure from animals that have grazed treated areas, cannot be used for composting or mulching on ground where susceptible crops may be grown the following season. To promote herbicide decomposition, plant material should be evenly incorporated or burned. Adequate moisture is also required to promote breakdown of plant residues which contain clopyralid.

Do not use in a greenhouse. Excessive amounts of this herbicide in the soil may temporarily inhibit seed germination or plant growth.

SPRAY EQUIPMENT - CLEANING INSTRUCTIONS

To avoid injury to desirable plants, equipment used to apply STINGER Herbicide should be thoroughly cleaned before reusing to apply any other chemicals.

1. Rinse and flush application equipment thoroughly after use at least three times with water, and dispose of rinse water in non-cropland area away from water supplies.
2. During the second rinse, add 1 qt of household ammonia for every 25 gallons of water. Circulate the solution through the entire system so that all internal surfaces are contacted (15-20 min.). Let the solution stand for several hours, preferably overnight.
3. Flush the solution out the spray tank through the boom.
4. Rinse the system twice with clean water, recirculating and draining each time.
5. Nozzles and screens should be removed and cleaned separately.

PRECAUTIONARY STATEMENTS

Environmental Hazards

Clopyralid is a chemical which can travel (seep or leach) through soil and under certain conditions contaminate groundwater which may be used for irrigation or drinking purposes. Users are advised not to apply clopyralid where soils have a rapid to very rapid permeability throughout the profile (such as loamy sand to sand) and the water table of an underlying aquifer is shallow, or to soils containing sinkholes over limestone bedrock, severely fractured surfaces, and substrates which would allow direct introduction into an aquifer. Your local agricultural agencies can provide further information on the type of soil in your area and the location of groundwater.

STORAGE AND DISPOSAL

Do not contaminate water, food or feed by storage or disposal.

Storage: Store above 28 °F or warm to 40 °F and agitate before use.

Pesticide Disposal: Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility.

Container Disposal (Metal) Do not reuse container. Triple rinse (or equivalent). Puncture and dispose of in a sanitary landfill, or by other procedures approved by state and local authorities.

Container Disposal (Plastic): Do not reuse container. Triple rinse (or equivalent). Puncture and dispose of in a sanitary landfill, or by incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

WARRANTY LIMITATIONS AND DISCLAIMER

DowElanco warrants that this product conforms to the chemical description on the label and is reasonably fit for the purposes stated on the label when used in strict accordance with the directions therein under normal conditions of use. **THIS IS THE ONLY WARRANTY MADE ON THIS PRODUCT. NO OTHER EXPRESS AND NO IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE IS MADE OUTSIDE OF THIS LABEL.** Therefore,

neither this warranty nor any other warranty of merchantability or fitness for a particular purpose, express or implied, extends to the use of this product contrary to label instructions (including conditions noted on the label, such as unfavorable temperatures, soil conditions, etc.), under abnormal conditions (such as excessive rainfall, drought, tornadoes, hurricanes, etc.) or under conditions not reasonably foreseeable to or beyond the control of seller.

When buyer or user suffers losses or damages resulting from the use or handling of this product (including claims based on contract, negligence, strict liability, or other legal theories), buyer or user must promptly notify in writing DowElanco of any claims to be eligible to receive either remedy given below. The **EXCLUSIVE REMEDY OF THE BUYER OR USER** and the **LIMIT OF LIABILITY** of DowElanco or any other seller will be one of the following, at the election of DowElanco:

- (1) **Refund of purchase price** paid by buyer or user for product bought, or
- (2) **Replacement** of amount of product used.

The seller will not be liable for consequential or incidental damages or losses.

The terms of this Warranty Limitations And Disclaimer cannot be varied by any written or verbal statements or agreements. Any employee or sales agent of the seller is not authorized to vary or exceed the terms of this Warranty Limitations And Disclaimer in any manner.

*Trademark of DowElanco

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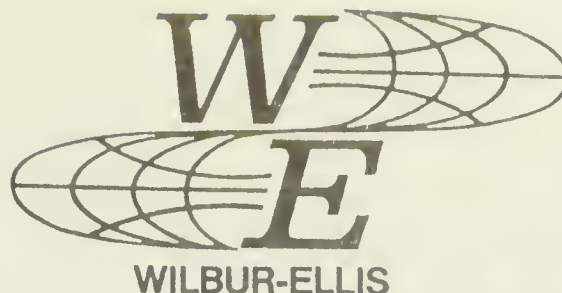
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Dow Elanco

Indianapolis, Indiana 46268 U.S.A.

* Registered Trademark of DowElanco

This is a specimen label. DowElanco is not responsible for the accuracy of the information contained herein. As labels are subject to revision, always carefully read and follow the label on the product container.



AMINE 4

2,4-D AMINE HERBICIDE

ACTIVE INGREDIENT:

Dimethylamine Salt of 2,4-Dichlorophenoxyacetic Acid 46.7%

INERT INGREDIENTS: 53.3%

TOTAL 100.0%

Equivalent to 38.8% of 2,4-Dichlorophenoxyacetic acid or 3.8 lb/gal.
Isomer specific by AOAC Method 6.275, 13th Ed, 1980.

EPA REGISTRATION NO. 39511-64-2935

EPA ESTABLISHMENT NO.: (See container).

PRECAUCION AL USUARIO: SI USTED NO LEE INGLES, NO USE ESTE PRODUCTO
HASTA QUE LA ETIQUETA LE HAYA SIDO EXPLICADA AMPLIAMENTE.

PRECAUTIONARY STATEMENTS

CAUTION

**HAZARDS TO HUMANS
AND
DOMESTIC ANIMALS**

Harmful if swallowed. Avoid breathing spray mist. Avoid contact with skin, eyes, and clothing. In case of contact, immediately flush eyes or skin with plenty of water. Get medical attention if irritation persists. Do not apply this product in such a manner as to directly or through drift expose workers or other persons. The area being treated must be vacated by unprotected persons.

ENVIRONMENTAL HAZARDS

Do not apply directly to water except as specified on this label for aquatic weed control. Do not contaminate water by cleaning of equipment or disposal of wastes. Do not contaminate water intended for irrigation or domestic purposes, except as specifically directed in the labeling. Do not apply when weather conditions favor drift from target area.

KEEP OUT OF REACH OF CHILDREN

CAUTION—CAUCION

**STATEMENT OF
PRACTICAL TREATMENT**

If Swallowed: Drink one or two glasses of water and induce vomiting by touching back of throat with finger. Do not give anything by mouth to an unconscious person. Get medical attention.

If On Skin: Wash contaminated areas thoroughly with soap and water. Do not reuse contaminated clothing until washed. Get medical attention if irritation persists.

If In Eyes: Flush with copious amounts of clean water for 10-15 minutes. Get medical attention.

AGRICULTURAL CHEMICAL

**DO NOT SHIP OR STORE WITH FOODS, FEEDS,
DRUGS, OR CLOTHING.**

**FOR CHEMICAL SPILL, LEAK, FIRE, OR
EXPOSURE CALL TOLL FREE**

1-800-424-9300

Distributed By
Wilbur-Ellis Company
P.O. Box 16458, Fresno, California 93755

DIRECTIONS FOR USE

It is a violation of Federal Law to use this product in a manner inconsistent with this labeling.

REENTRY STATEMENT: Do not enter treated areas without protective clothing until sprays have dried. Protective clothing should include hat or other suitable head covering, long sleeved shirt and long legged trousers, or a coverall type garment, shoes, and socks.

Because certain states may require more restrictive reentry intervals for various crops treated with this product, consult your State Department of Agriculture for further information.

Written or oral warnings must be given to workers who are expected to be in a treated area or in an area about to be treated with this product. The front panel PRECAUTIONARY STATEMENTS should be read to workers as well as the instruction not to enter until sprays have dried. When oral warnings are given, warnings shall be given in language customarily understood by workers. Oral warnings must be given if there is reason to believe that written warnings cannot be understood by workers. Written warnings must include the following information:

CAUTION: Area treated with 2,4-D on (date of application). Do not enter without appropriate protective clothing until sprays have dried. (insert here **Statements of Practical Treatment** as on front panel.)

STORAGE AND DISPOSAL

STORAGE: Do not contaminate water, food, or feed by storage or disposal. Open dumping is prohibited. Do not store this product near fertilizers, seeds, insecticides, or fungicides. Containers should not be stacked more than six (6) high. Reclose all partially used containers by thoroughly tightening screw cap. Damaged or leaking containers which cannot be used immediately should be transferred to suitable sound containers and properly marked. Absorb any spill with a suitable clay absorbant and dispose of as indicated under "Pesticide Disposal."

For safety and prevention of unauthorized use, all pesticides should be stored in locked facilities.

To prevent accidental misuse, different pesticides should be stored in separate areas with enough distance between to provide clear identification.

Opened, partially used pesticides should be stored in original *labeled* containers when possible. When transfer to another container is necessary because of leakage or damage, carefully mark, and identify contents of the new container.

PESTICIDE DISPOSAL: Pesticide wastes are toxic. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of federal law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency or the Hazardous Waste representative at the nearest EPA Regional Office for guidance.

CONTAINER DISPOSAL: Triple rinse (or equivalent), adding rinsate to spray tank. Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or by other procedures approved by state and local authorities.

GENERAL INFORMATION

Performance of this product may be affected by local conditions, crop varieties, and application method. User should consult local extension service, agricultural experiment, or university weed specialists, and state regulatory agencies for recommendations in your area.

Best results are obtained when product is applied to young succulent weeds that are actively growing. Application rates lower than recommended will be satisfactory on susceptible annual weeds. For perennial weeds and conditions such

as the very dry areas of the western states, where control is difficult, the higher recommended rates should be used.

When product is used for weed control in crops, the growth stage of the crop must be considered.

Some plants and weeds, especially woody varieties, are difficult to control and may require repeat applications. Application rates should be 1 to 5 gallons of total spray by air or 5 to 25 gallons by ground equipment unless otherwise directed. In either case, use the same amount of 2,4-D recommended per acre. For crop uses, do not mix with oil, surfactants, or other adjuvants unless specifically recommended on label. To do so may reduce herbicides selectivity and could result in crop damage.

Aerial application should be used only when there is no danger of drift to susceptible crops. Many states have regulations concerning aerial application of 2,4-D formulations. Consult local regulatory authorities before making applications. This product contains the Dimethylamine salt of 2,4-D, one of the least volatile forms of 2,4-D. Vapors released by this product are insufficient to cause damage to adjacent susceptible crops.

Because coarse sprays are less likely to drift than fine, do not use equipment (such as hollow cone small orifice nozzles) or conditions (such as high pressure) that produce such sprays.

Product should not be allowed to come into contact with desirable, susceptible plants such as beans, cotton, fruit trees, grapes, legumes, ornamentals, peas, tomatoes, and other vegetables. Product should not be used in greenhouses. Excessive amounts of this product in the soil may temporarily inhibit seed germination and all plant growth.

Users should note that herbicide treatment of public water requires a permit from appropriate state agencies in most states. Your state Conservation Department, or Game and Fish Commission will aid you in securing a permit in your state.

If stored below freezing, it may be necessary to warm product to 70° F and agitate before using. This does not affect the efficiency of the product.

Spray equipment used to apply 2,4-D should not be used for any other purpose until thoroughly cleaned with a suitable chemical cleaner.

Spray Preparation: Add the recommended amount of product to approximately one-half the volume of water to be used for spraying. Agitate well, then add the remainder of the water. Continue agitation during application until spray tank is empty.

Use in Liquid Nitrogen Fertilizer: Product may be combined with liquid nitrogen fertilizer suitable for foliar application of corn, grass, pastures, or small grains in one operation. Use product according to directions on this label for those crops. Use liquid nitrogen fertilizer at rates recommended by supplier or extension service specialist. Mix the product and fertilizer according to the following instructions:

Fill the spray tank approximately 1/2 full with the liquid nitrogen fertilizer. In a separate clean container, mix the amount of product to be used with an equal amount of water. Add the product mixture to the spray tank while agitating. Add the remainder of the fertilizer while continuing to agitate. Apply immediately maintaining agitation during application until tank is empty. **DO NOT APPLY DURING COLD (NEAR FREEZING) WEATHER.** Spray mixture must be used immediately and may not be stored.

NOTE: Pre-mixing the product with an equal amount of water is important.

WHERE TO USE

This product is used to control broadleaved weeds in cereal crops, corn, sorghum, weeds and brush in rangeland, pastures, rights-of-way and similar noncrop uses, tree injection and for aquatic weed control.

PLANTS CONTROLLED

Product will kill or control the following in addition to many other noxious plants susceptible to 2,4-D: arrowweed, arthurochloa, bindweed (hedge, field, and European), bitter wintercreeper, box elder, buckhorn, bull thistle, butchur, burdock, bur ragweed, ground ivy, hemp, hoary cress, honeysuckle, indigo, ironweed, jimsonweed, lambsquarters, locoweed, Mexican weed, morningglory, mustard, parrotfeather, pennywort, pigweed, plantain, poison ivy, pokeweed, povertyweed, buttercup, Canada thistle, catnip, chickweed, chickory, cocklebur, coffee bean, creeping jenny, creole indigo, duckweed, elderberry, goldenrod, puncture vine, purslane, rush, Russian thistle, sagebrush, shepherds purse, smartweed, sow thistle, stinkweed, sumac, sunflower, Virginia creeper, water hyacinth, water lily, water primrose, wild garlic, wild lettuce, wild onion, wild radish, willow, witchweed.

CROPS:

SMALL GRAINS NOT UNDERSEEDED WITH A LEGUME (BARLEY, OATS, WHEAT, RYE): See table for recommended use rates.

Spray when weeds are small after grain begins tillering but before boot stage (usually 4 to 8 inches tall). Do not apply before the tiller stage nor from early boot through milk stage. To control large weeds that will interfere with harvest or to suppress perennial weeds, preharvest treatment can be applied when the grain is in the dough stage. Best results will be obtained when soil moisture is adequate for plant growth and weeds are growing well.

Spring Planted Oats: Apply in sufficient water to give good coverage. Apply after the fully tillered stage, except during the boot to dough stage.

Fall Planted Oats: Apply after full tillering but before early boot stage. Some difficult weeds may require higher rates of 1 to 1½ pints per acre for maximum control, but injury may result. Do not spray during or immediately following cold weather.

Note: Oats are less tolerant to 2,4-D than wheat or barley and more likely to be injured. Do not forage or graze treated grain fields within 2 weeks after treatment with 2,4-D. Do not feed treated straw to livestock.

CORN: See table for recommended use rates.

Preemergent: Apply product from 3 to 5 days after planting but before corn emerges. Do not use on very light, sandy soils. Use the higher rates on heavy soils. Plant corn as deep as practical.

Post Emergent: Best results are usually obtained when weeds are small and corn is 5 to 18 inches tall. When corn is over 8 inches tall, use drop nozzles. Do not apply from tasseling to dough stage. If corn is growing rapidly and temperature and soil moisture content is high, use ½ pint per acre rate to reduce possibility of crop damage. Delay cultivation for 8 to 10 days to prevent stalk breakage due to temporary brittleness caused by 2,4-D. Application rates of up to 1 pint/acre may be used to control some hard to control weeds. However, the possibility of injury to the corn is increased.

If corn is over 8 inches tall, use drop nozzles to keep spray off corn foliage as much as possible. Do not use with oil, atrazine, or other adjuvants. Since the tolerance to 2,4-D of individual hybrids varies, consult your local Extension Service, Agricultural Experiment Station, or University Weed Specialist for information.

Pre-Harvest: After the hard dough or denting stage, apply 1 to 2 pints of product per acre by air or ground equipment to suppress perennial weeds, decrease weed seed production, and control tall weeds such as bindweed, cocklebur, dogbane, jimsonweed, ragweed, sunflower, velvetleaf, and vines that interfere with harvesting. Do not forage or feed corn fodder to livestock for 7 days following application.

SORGHUM (Milo): See table for recommended rate. Apply to sorghum when crop is 4 to 12 inches high with secondary

roots well established. Use drop nozzles when crop is over 10 inches high. Do not apply from flowering to dough stage. Rates of up to 1 pint per acre may be used to control some hard to control weeds. However, the chance of crop injury is increased with the higher rates. Do not use with oil. Use lower rate if conditions of high temperature and high soil moisture exist.

RICE: See table for recommended rate. Apply the product in sufficient water to cover one acre when weeds are in active growth stage. Rice plants are sensitive to 2,4-D in early stages of growth, therefore, it is advisable to delay spraying until the second or third week after flooding. Water in the field should be shallow enough to permit direct application of the spray material to the weeds. Make all treatments well in advance of heading.

SUGARCANE: See table for recommended rate. Apply as a pre- or post-emergent spray in the spring after canes emerge and through lay-by. Consult local Agricultural Experiment or Extension Service Weed Specialists on specific use of this product, or in combination with Dowpon M, to control broad-leaved and grass weeds.

RECOMMENDED RATE OF AMINE 4 PER ACRE**

Crop	Normal Rates (usually safe to crop)	Higher rates for Special Situations* (more likely to injure crop)
<i>Small Grains</i>		
Spring Postemergent wheat, barley, rye oats	2/3 to 1-1.3 pints ½ to 1 pint	2 to 3 pints 1½ to 2 pints
Preharvest (dough stage) wheat, barley, oats	1 to 2 pints	2 to 3 pints
<i>Corn</i>		
Preemergent	2 to 4 pints	
Emergence	1 pint	1½ pints
Postemergent up to 8 inches tall	½ to 1 pint	
8 inches to tasseling (use only directed spray)	1 pint	1½ to 2½ pints
Preharvest	1 to 2 pints	
<i>Sorghum</i>		
Postemergent 6 to 8 inches tall	2/3 to 1 pint	
8 to 15 inches tall (use only directed spray)	1 pint	1½ to 2 pints
<i>Rice</i>	1 to 2½ pints	2 to 3 pints
<i>Sugarcane</i>	2 to 4 pints	

NOTE: The higher rates as recommended above may be necessary to control difficult weed problems, such as dry conditions in the Western States. They should not be used, however, unless possible crop injury is acceptable. User should consult local Extension Service or Agriculture Experiment Station Weed Specialist for recommendations on special conditions.

* Arizona Idaho Montana Nevada Oregon Utah Washington Wyoming

** If band treatment is used, base the dosage rate on the actual area sprayed.

ORNAMENTAL TURF: Use 1 to 3 pints of product in enough water to give good coverage to one acre on established stands of perennial grasses, depending on type of weeds and stage of growth. Do not use on creeping grasses such as Bent except for spot spraying. Newly seeded turf should not be treated until after the second mowing and the lower dosage rate should be used.

GRASS SEED CROPS: Apply 1 to 4 pints of product per acre in the Spring or Fall to control broadleaf weeds in grass being grown for seed. Do not apply from early boot to milk stage. Spray seedling grass only after the five leaf stage, using ¾ to 1 pint per acre to control small seedling weeds. After the grass is well established, higher rates of up to 4 pints per acre can be used to control hard to kill annual or perennial weeds. For best results, apply when soil moisture is adequate for good growth. Do not use on Bent unless injury can be tolerated. Do not graze dairy animals nor cut forage for hay within 7 days of application.

FALLOW LAND: On established perennial species such as

Canada thistle and Field bindweed, apply up to 3 quarts of product per acre. For annual broadleaf weeds, apply 1 to 2 quarts per acre. Do not plant any crop for 3 months after treatment or until 2,4-D has disappeared from soil.

ESTABLISHED PASTURES AND RANGELANDS: Use 1 to 4 pints of product in sufficient water to give good coverage to one acre depending on type of weeds and stage of growth. Use only on established stands of perennial grasses. DO NOT graze dairy animals nor cut forage for hay within 7 days of application.

GENERAL WEED CONTROL (Airfields, Roadsides, Vacant Lots, Drainage Ditch Banks, Fence Rows, Industrial Sites and similar areas): Use 1 to 3 quarts of product per acre. Usually 2 quarts per acre will give adequate control. Do not use on herbaceous ground covers or creeping grass such as Bent. Legumes will usually be damaged or killed. Deep-rooted perennials may require repeat applications. Do not use on freshly seeded turf until grass is well established. Delay reseeding for 3 months or until 2,4-D has disappeared from soil.

WOODY PLANT CONTROL: To control woody plants susceptible to 2,4-D, such as alder, buckbrush, elderberry, sumac, and willow on non-crop areas, use 2 to 3 quarts of product per acre in 100 gallons of water. Wet all parts of the plants thoroughly, including stem and foliage, to the point of run-off. Higher volumes of up to 400 gallons per acre are necessary where the brush is very dense and over 6 to 8 feet high. Applications are more effective when made on actively growing plants. Treatment should not be made during time of severe drought or in early Fall when leaves lose their green color. Hard to control species may require re-treatment next season.

TREE INJECTION: For the control of unwanted hardwoods such as elm, oak, hickory, and sweetgum in forest and other non-crop areas, apply undiluted product by injecting 1 ml through the bark, using one injection per inch of trunk diameter measured at breast height (4½ feet). For harder to control species (ash, maple, dogwood), use 2 ml of undiluted product per injection. All injections should be as near the root collar as possible and should be evenly spaced around the trunk. Injections may be made at any time of the year but are most effective during the growing season. Maples should not be treated during the spring sap rise.

AQUATIC APPLICATIONS

WEEDS AND BRUSH ON IRRIGATION CANAL DITCH-BANKS—Sixteen Western States: Arizona, Colorado, Idaho, Kansas, Montana, Nebraska, New Mexico, Nevada, North Dakota, Oklahoma, Oregon, South Dakota, Texas, Utah, Washington, Wyoming.

For control of annual and perennial broadleaf weeds, apply 1 to 2 quarts of product per acre in approximately 20 to 100 gallons of total spray. Treat when weeds are young and actively growing before the bud or early bloom stage. For harder to control weeds, a repeat spray may be needed after 3 to 4 weeks for maximum results, using the same rates.

Apply no more than 2 treatments per season. For woody brush

and patches of perennial broadleaf weeds, mix one gallon of product in 150 gallons of water. Wet foliage thoroughly, using approximately 1 gallon of spray solution per square rod.

Spraying Instructions: Low pressure (10 to 40 psi) power spray equipment should be used and mounted on a truck, tractor, or boat. Apply while traveling upstream to avoid accidental concentration of chemical into water. Spray when the air is calm, 5 mph or less. Do not use on small canals (less than 10 CFS) where water will be used for drinking purposes.

Boom spraying onto water surface must be held to a minimum and no cross-stream spraying to opposite banks should be permitted. When spraying shoreline weeds, allow no more than 2-foot overspray onto water with an average of less than one-foot overspray to prevent introduction of greater than negligible amounts of chemical into the water.

Do not allow dairy animals to graze on treated areas for at least 7 days after spraying. Water within treated banks should not be fished.

FOR AQUATIC WEEDS IN LAKES, PONDS, DRAINAGE DITCHES, AND MARSHES: Use 2½ to 4½ pints of product in 50 to 100 gallons of water per acre. Spray to wet foliage thoroughly. Application should be made when leaves are fully developed above water line and plants are actively growing. Your State Conservation Department or Game and Fish Commission will assist you in determining the best time and rate for application under local conditions.

DO NOT APPLY to more than 1/3 to 1/2 of a lake or pond in any one month because excessive decaying vegetation may deplete oxygen content of water, and kill fish.

Do not contaminate water used for irrigation or domestic purposes.

Perennial and other hard to control weeds may require a repeat application to give adequate control.

CONDITIONS OF SALE AND WARRANTY

WILBUR-ELLIS AND SELLER OFFER THIS PRODUCT AND THE BUYER AND USER ACCEPT THIS PRODUCT UNDER THE FOLLOWING AGREED CONDITIONS OF SALE AND WARRANTY.

The directions for use of this product are believed to be reliable and should be followed carefully. However, it is impossible to take into account all variables and to eliminate all risks associated with its use. Injury or damage may result because of conditions which are beyond the control of Wilbur-Ellis or the Seller. Wilbur-Ellis warrants only that this product conforms to the chemical description on the label and is believed to be reasonably fit for the purposes referred to in the Directions for Use when used as directed under normal conditions. WILBUR-ELLIS MAKES NO OTHER EXPRESS OR IMPLIED WARRANTY OF FITNESS OR MERCHANTABILITY OR ANY OTHER EXPRESS OR IMPLIED WARRANTY. In no case shall Wilbur-Ellis or the Seller be liable for consequential, special or indirect damages resulting from the use or handling of this product. Any variation or exception from this warranty must be in writing and signed by an authorized Wilbur-Ellis representative.



AMINE 4

2,4-D AMINE HERBICIDE

PRECAUTIONARY STATEMENTS
WARNING

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

Causes eye and skin irritation. Do not get in eyes, on skin or on clothing. Harmful if swallowed. Do not breathe vapors or spray mist.

ENVIRONMENTAL HAZARDS

Do not apply directly to water.
Do not apply when weather conditions favor drift from target area.
Spray equipment used in applying this product should be thoroughly cleaned before using for any other purposes.
Use repeated flushing with soap and warm water or suitable chemical cleaner. It is best to use a separate sprayer for application of insecticides and fungicides.
Do not contaminate water by cleaning of equipment or disposal of wastes.
This product will kill or seriously injure many desirable forms of vegetation. Do not apply directly in lawns, fruits, vegetables, grapes, ornamentals, cotton or other desirable plants. Do not use when there is hazard from drifting mists. (Coarse sprays are less likely to drift.) Vapors from this product may injure susceptible plants in the immediate vicinity.
Avoid contamination of water used for domestic purposes and irrigation purposes. Excessive amounts of this product in the soil may temporarily inhibit seed germination and plant growth.

PHYSICAL OR CHEMICAL HAZARDS

Do not use, pour, spill or store near heat or open flame.

DIRECTIONS FOR USE

It is a violation of Federal Law to use this product in a manner inconsistent with its labeling.

RE-ENTRY STATEMENT

Do not enter treated areas without protective clothing until sprays have dried. Protective clothing means, at least, a hat or other suitable head covering, a long-sleeved shirt and long-legged trousers or a coverall type garment (all of closely woven fabric covering the body, including the arms and legs), shoes and socks.
Because certain states may require more restrictive re-entry intervals for various crops treated with this product, consult your State Department of Agriculture for further information.

STORAGE AND DISPOSAL

DO NOT CONTAMINATE WATER, FOOD OR FEED BY STORAGE OR DISPOSAL

STORAGE

Store in a dry location away from children, animals, foods, feeds, seeds and other agricultural chemicals. Keep container closed when not using. Do not allow water into container as this may cause deterioration of product.
Handle in accordance with information given under "Precautionary Statements".

Keep storage area locked when not in use.

In the event of spillage or leakage, soak up material with absorbent clay, sand, sawdust or other absorbent material. Scrape up and dispose of in accordance with information given under "Pesticide Disposal". Repackage and relabel useable product in a sound container.

In case of fire or other emergency, report at once by toll-free telephone to 800-424-9300.

DISPOSAL

PESTICIDE DISPOSAL: Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility.

CONTAINER DISPOSAL:

METAL CONTAINERS — Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or by other procedures approved by state and local authorities.
PLASTIC CONTAINERS — Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

Wilbur-Ellis

MCPA ESTER 4

HERBICIDE

FOR SELECTIVE CONTROL OF CERTAIN WEEDS IN WHEAT, OATS, BARLEY, RYE, GRASSLAND AND IN NON-CROP AREAS

ACTIVE INGREDIENT:

Isocetyl ester of 2-methyl-4-chlorophenoxyacetic acid*

INERT INGREDIENTS:

TOTAL

*Equivalent to 44.7% of 2-methyl-4-chlorophenoxyacetic acid isomer specific or not less than 3.7 pounds of 2-methyl-4-chlorophenoxyacetic acid isomer specific per gallon at 68° F. Isomer specific by AOAC Method.

55%

30%

100%

KEEP OUT OF REACH OF CHILDREN
WARNING—AVISO

IF SWALLOWED: Contains mineral spirits. Do not induce vomiting. Get medical attention immediately. Never give anything by mouth to an unconscious person.

IF ON SKIN: Wash skin with soap and water.

IF IN EYES: Flush eyes with water for 15 minutes and get medical attention.

SEE ADDITIONAL PRECAUTIONS ON LEFT SIDE PANEL

EPA Reg. No. 42545-44-2935

EPA Est. No. 42545-MO-1

MANUFACTURED FOR

Wilbur-Ellis

P.O. BOX 16458
FRESNO, CA 93755

NET CONTENTS _____ GALLONS _____ LITERS

PRECAUCION AL USUARIO: SI USTED NO LEE INGLES, NO USE ESTE PRODUCTO HASTA QUE LA ETIQUETA LE HAYA SIDO EXPLICADA AMPLIAMENTE

CONTINUED ON REVERSE SIDE

CONTROLS THESE AND OTHER WEEDS

Susceptible (Most Areas): Lambsquarters (goosefoot), Marsh Elder, Mustards (annual), Puncturevine Ragweed Slink-weed (Pennycress, Fanweed), Wild Radish, Yellow Rocket or Wintercress, Cocklebur, Goats Beard, Field Pepper Grass, Dragon Head Mint, Beggarticks, Polson Hemlock, Hempnettle, Shepherds-purse, Annual Sow Thistle, Less Susceptible: Buttercups, Canada Thistle, Dandelions, Plantains, Stinging Nettle, Perennial Sow Thistle, Veich, White Top or Hoary Cress, Russian Pigweed, Sunflower, Chervil, Miner's Lettuce, Purslane, Kochia.

PREPARATION OF THE SPRAY

Fill the spray tank with half the required amount of water, then add the recommended amount of LV4-MCPA and continue filling the spray tank with the balance of water. Keep agitator running when filling spray tank and during spray operations. For crop uses, do not mix with oil, surfactant or other adjuvants as this may reduce selectivity to crops resulting in crop damage or kill.

AMOUNT OF SPRAY TO APPLY

Apply 5 to 15 gallons of total spray per acre when making applications with ground equipment and 3 to 10 gallons of total spray per acre when making applications by aircraft unless directed otherwise under specific directions. Carefully read the Environmental Hazards section of the Precautionary Statements for further information on spray volume.

SELECTIVE SPRAYING

Wheat, Oats, Barley and Rye - Apply as a water mix spray by ground sprayer or airplane. Use $\frac{1}{2}$ to 1 pint per acre for the more susceptible weeds after crop has reached the 3 to 4 leaf stage up to boot stage. Use up to 3 pints per acre for the less susceptible weeds after crop has tillered and up to early boot stage. Do not spray from boot to dough stage. Do not forage or graze meat animals on treated areas within 7 days of slaughter. Do not forage or graze dairy animals on treated areas within 7 days after treatment.

FLAX

Use $\frac{1}{4}$ to $\frac{1}{2}$ pint per acre. Apply by ground sprayer or by airplane. Apply only when weeds are up and when flax is 4 to 8 inches high and before it comes into bud. Treatment after early bud stage may result in severe damage. If Canada Thistle is present, it may be necessary to go as high as $\frac{3}{4}$ pint per acre to prevent seed head production. Some injury to the flax may result.

Do not forage or graze meat animals on treated areas within 7 days of slaughter. Do not forage or graze dairy animals on treated areas within 7 days after treatment.

GRASSES

Established Grassland - Use 1 to 3 pints per acre in sufficient water (10 to 100 gallons) by airplane or ground sprayer application and give thorough coverage. Use higher rate for White Top, Canada Thistle and other less susceptible weeds. Spray perennials in early bud to full bloom stage and regrowth in fall; other weeds in spring or fall, when actively growing. Do not forage or graze meat animals on treated areas within 7 days of slaughter. Do not forage or graze dairy animals on treated areas within 7 days after treatment.

GRASSES: (Grown for seed: aerial and surface applications): Use 1 to 2 pints per acre, the higher rate where weed stands are heavy. In established grasses apply in spring before head comes into boot and on seedling grass after grass has tillered. NOTE: For weed control in grasses, repeated treatment may be needed for less susceptible weeds. In some areas bent, buffalo, carpet and St. Augustine grasses may also be injured by treatment.

NON-CROP SPRAYING ALONG FENCE ROWS AND ROADSIDES

Canada Thistle, White Top and Meadow Buttercup - For spot treatment, use $\frac{1}{4}$ pint to 3 to 4 gallons of water, or $\frac{3}{4}$ gallon in sufficient water to give coverage for most extensive areas. Spray to wet weeds thoroughly when in bud to early bloom and again on fall regrowth.

GENERAL INFORMATION

Local conditions may affect the use of this chemical. Consult State Agricultural Extension or Experiment Station weed specialists for specific recommendations for local weed problems and for information on possible lower dosages. Follow directions carefully. Timing and method of application, weather and crop conditions, mixtures with other chemicals not specifically recommended and other influencing factors in the use of this product are beyond the control of the seller. Buyer assumes all risks of use, storage or handling of this material not in strict accordance with directions given herewith. In no case shall the seller be liable for consequential, special, or indirect damages such as loss of profits or values resulting from the use or handling of this product.

CONDITION OF SALE, WARRANTY, LIMITATION OF LIABILITY

This product conforms to the chemical description on the label thereof and is reasonably fit for the purposes stated on such label only when used in accordance with directions under normal use conditions. Follow directions carefully. Timing and method of application, weather and crop conditions, mixture with other chemicals not specifically recommended and other influencing factors in the use of this product are beyond the control of the seller. Buyer assumes all risks of use, storage, or handling of this material not in strict accordance with directions given herewith. In no case shall the seller be liable for consequential, special, or indirect damages such as loss of profits or values resulting from the use or handling of this product.

IN CASE OF EMERGENCY, CALL CHEMTREC: (800) 424-9300

Banvel[®]

HERBICIDE

ACTIVE INGREDIENTS:

Dimethylamine salt of dicamba
(3,6-dichloro-*o*-anisic ac.id)* 48.2%
Dimethylamine salts of related acids 12.0%

INERT INGREDIENTS: 39.8%
TOTAL . . . 100.0%

*This product contains 40.0% 3,6-dichloro-*o*-anisic acid (dicamba) or 4 pounds per gallon.

KEEP OUT OF REACH OF CHILDREN
WARNING
SEE BACK PANEL FOR ADDITIONAL
PRECAUTIONARY STATEMENTS



SANDOZCROP PROTECTION

10664.9 BLACK SLEEVECO

DISC 139 — File No. 01
01-18-88 cm/jk Hel.Reg.-1, Hel.Bld.-2, Hel.Bld.Cond.-4(114)
Job No. 0938 Sandoz BANVEL-2½ Gal.
GALLEY 01

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

WARNING

Causes eye irritation. Do not get in eyes, on skin, or on clothing. Harmful if swallowed. Avoid breathing spray mist. Wash thoroughly after handling. In case of contact, wash skin with soap and water, for eyes flush with water for 15 minutes and get medical attention.

ENVIRONMENTAL HAZARDS

Keep out of lakes, streams or ponds. Do not contaminate water by the cleaning of equipment or disposal of wastes. Apply this product only as directed on label.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

Do not apply this product through any type of irrigation system.

Refer to the DIRECTIONS FOR USE Booklet attached to this container for proper use directions and additional precautionary statements.

For additional copies of the DIRECTIONS FOR USE Booklet, write to the manufacturer.

STORAGE AND DISPOSAL

PROHIBITIONS

Do not contaminate water, food or feed by storage or disposal.

STORAGE

Store in original container in a well ventilated area separately from fertilizer, feed and foodstuffs. Avoid cross-contamination with other pesticides. Spillage or leakage should be contained and absorbed with clay granules, sawdust or equivalent material for disposal.

PESTICIDE DISPOSAL

Triple rinse pesticide from containers and use rinsates in the pesticide application. Wastes which cannot be used according to label instructions may be disposed of on site or at an approved waste disposal facility.

CONTAINER DISPOSAL

Plastic or Metal: After triple rinsing (or equivalent), offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or by other procedures approved by state and local authorities, such as burning of plastic containers. If burned, stay out of smoke.

DISC 139 -- File No 01
03-01 88 cm/k Hel Reg -1, Hel Bid -2, Hel Bid Cond -4(114)
Job No 0938 Sandoz BANVEL 2 1/2 Gal
GALLEY 01

#0692

EPA Reg. No. 55947-1
EPA Est. No. 55947-TX-1

NET CONTENTS:
2½ GALLONS (9.46 L)

ACTIVE INGREDIENT
Dimethylamine salt
(3,6-dichloro-o-
Dimethylamine salt
INERT INGREDIENT

*This product contains
acid (dicamba) or 4

LIMITED WARRANTY AND LIABILITY

NOTICE: Read this Limited Warranty and Liability before buying or using this product. If terms are not acceptable, return it at once, unopened.

It is critical that this product be used and mixed only as specified on the label. The laws of a State may make some or all of this paragraph inapplicable or may give you rights in addition to your rights hereunder. Except to the extent prohibited by applicable law, the exclusive remedy of the user or buyer and the limit of liability of this Company or any other Seller for any and all losses, personal injuries or damages resulting from the use of this product, shall be the purchase price paid by the user or buyer for the quantity of product involved. Except to the extent prohibited by State Law, there is no warranty, and this Company and other Sellers disclaim all liability for losses, personal injury or damages, (i) arising from any use of this product in a manner or for a purpose not recommended in its label directions, or from mixing this product before use with any substance except as recommended by the product's label; (ii) arising from handling or storage in violation of label instructions; (iii) for all indirect, special or consequential damages; (iv) when not reported to this Company within one year of discovery. THERE ARE NO IMPLIED WARRANTIES AND NO WARRANTIES OF MERCHANTABILITY OR FITNESS.

0715151-10-AD

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KEEP OUT OF
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SEE BACK P
PRECAUTI

0715100-40-AD

SANDOZ
CROP PROTECTION
CORPORATION
DES PLAINES IL 60015



PROSPER WITH
PESTICIDES BY
USING THEM
PROPERLY! READ
AND FOLLOW LABEL
DIRECTIONS



NOTICE: READ "LIMIT OF
WARRANTY AND LIABILITY" ON
THE CONTAINER BEFORE
BUYING OR USING. IF TERMS
ARE NOT ACCEPTABLE, RETURN
AT ONCE UNOPENED.

THIS LABELING MUST BE IN THE
POSSESSION OF THE USER AT
THE TIME OF THE PESTICIDE
APPLICATION

HERBICIDE

Banvel

Banvel

HERBICIDE

DIRECTIONS FOR USE

IT IS A VIOLATION OF FEDERAL
LAW TO USE THIS PRODUCT IN A
MANNER INCONSISTENT
WITH ITS LABELING.

THIS LABELING MUST BE IN
THE POSSESSION OF THE
USER AT THE TIME OF
THE PESTICIDE APPLICATION

EPA Reg. No. 55947-1

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SANDOZCROP PROTECTION



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BEFORE USING BANVEL HERBICIDE
READ AND FOLLOW THE PRECAUTIONS
APPEARING ON THE CONTAINER
IMPORTANT

The following directions apply to all uses of BANVEL® Herbicide. Additional precautions and restrictions will be found in each specific use section.

Do not contaminate irrigation ditches or water used for domestic purposes.

SENSITIVE CROP PRECAUTIONS: BANVEL Herbicide may cause injury to desirable trees and plants, particularly beans, cotton, flowers, fruit trees, grapes, ornamentals, peas, potatoes, soybeans, sunflowers, tobacco, tomatoes and other broadleaf plants when contacting their roots, stems or foliage. These plants are most sensitive to BANVEL Herbicide during their development or growing stage. FOLLOW THE PRECAUTIONS LISTED BELOW WHEN USING BANVEL HERBICIDE.

- Do not treat areas where either possible downward movement into the soil or surface washing may cause contact of BANVEL Herbicide with the roots of desirable plants such as trees and shrubs.
- Avoid making applications when spray particles may be carried by air currents to areas where sensitive crops and plants are growing. Do not spray near sensitive plants if wind is gusty or in excess of 5 mph and moving in the direction of nearby sensitive crops. However, always make applications when there is some air movement to determine the direction and distance of possible spray drift. Leave an adequate buffer zone between area to be treated and sensitive plants. Coarse sprays are less likely to drift out of the target area than fine sprays. Agriculturally approved drift-reducing additives may be used.

- Do not apply BANVEL Herbicide in the vicinity of sensitive crops when the temperature on the day of application is expected to exceed 85° F as drift is more likely to occur.
- Do not use aerial equipment to apply BANVEL Herbicide when sensitive crops and plants are growing in the vicinity of area to be treated.
- To avoid injury to desirable plants, equipment used to apply BANVEL Herbicide should be thoroughly cleaned (see PROCEDURE FOR CLEANING SPRAY EQUIPMENT on pages 6-7) before reusing to apply any other chemicals.

All crop uses of BANVEL Herbicide are intended for a normal growing interval between planting and harvest. No crop rotation restrictions exist if normal harvest of treated crop has occurred. If this interval is shortened, such as in cover crops that will be plowed under, do not follow up with the planting of a sensitive crop.

Crops growing under stress conditions such as drought, poor fertility, or foliar damage due to hail, wind or insects, can exhibit various injury symptoms that may be more pronounced if herbicides are applied.

Consult your local or state authorities for possible application restrictions and advice concerning these and other special local use situations. Tank mix recommendations are for use only in states where the tank mix product and application site are registered.

Do not apply this product through any type of irrigation system.

PROCEDURE FOR CLEANING SPRAY EQUIPMENT

The steps listed below are suggested for thorough cleaning of spray equipment following applications of BANVEL Herbicide or tank mixes of BANVEL Herbicide plus 2,4-D amine.

- 1) Hose down thoroughly the inside as well as outside surfaces of equipment while filling the spray tank half full of water. Flush by operating sprayer until the system is purged of the rinse water.
- 2) Fill tank with water while adding 1 quart of household ammonia for every 25 gallons of water. Operate the pump to circulate the ammonia solution through the sprayer system for 15 to 20 minutes and discharge a small amount of the ammonia solution through the boom end nozzles. Let the solution stand for several hours, preferably overnight.
- 3) Flush the solution out of the spray tank through the boom.
- 4) Remove the nozzles and screens and flush the system with two full tanks of water.

The steps listed below are suggested for thorough cleaning of spray equipment used to apply BANVEL Herbicide as a tank mix with wettable powders (WP), emulsifiable concentrates (EC), or other types of water-dispersible formulations. BANVEL Herbicide tank mixes with water-dispersible formulations require the use of a water/detergent rinse.

- 5) Complete step 1.
- 6) Fill tank with water while adding 2 lbs. of detergent for every 40 gallons of water. Operate the pump to circulate the detergent solution through the

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sprayer system for 5 to 10 minutes and discharge a small amount of the solution through the boom and nozzles. Let the solution stand for several hours, preferably overnight.

- 7) Flush the detergent solution out of the spray tank through the boom.
- 8) Repeat step 1, and follow with steps 2, 3, and 4.

REFER TO THE CONTAINER LABEL FOR INSTRUCTIONS CONCERNING DISPOSAL OF WASTE AND CLEANING RINSES.

MIXING AND APPLICATION

UNLESS OTHERWISE SPECIFIED UNDER THE INDIVIDUAL USE HEADINGS OF THIS BOOKLET, THE FOLLOWING DIRECTIONS APPLY TO ALL CROP AND NON-CROP USES OF BANVEL HERBICIDE. REFER TO INDIVIDUAL USE SECTIONS FOR ADDITIONAL PRECAUTIONS, RESTRICTIONS, APPLICATION RATES AND TIMINGS.

BANVEL Herbicide is a water-soluble formulation that can be applied using wetter or sprayable fluid fertilizer as the carrier. If a fluid fertilizer is to be used, a compatibility test (see COMPATIBILITY TEST on page 9) should be made prior to tank mixing.

Ground or aerial application equipment which will give good spray coverage of weed foliage should be used. HOWEVER, DO NOT USE AERIAL APPLICATION EQUIPMENT IF SENSITIVE CROPS ARE GROWING IN THE VICINITY OF THE AREA TO BE TREATED.

Apply 5 to 50 gallons of diluted spray per treated acre when using ground application equipment, or 3 to 10 gallons of diluted spray per treated acre when using

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RON K. GRAPHIC SERVICES, LTD.

c. 110 — File No. 02

17-87 cm Hel. Reg. -1; Hel. Bold-2; (114)

No. 0358 Sandoz Banvel Booklet
ley 4

RON K. GRAPHIC SERVICES, LTD.

c. 110 — File No. 03

17-87 cm Hel. Reg. -1; Hel. Bold-2; (114)

No. 0358 Sandoz Banvel Booklet
ley 5

aerial application equipment. Use the higher level of the listed spray volumes when treating dense or tall vegetation. Use coarse sprays.

Select nozzles designed to produce minimal amounts of fine spray particles. Spray with nozzles as close to the weeds as is practical for good weed coverage.

BANVEL Herbicide should not be applied during periods of gusty wind or when wind is in excess of 15 mph as uneven spray coverage may occur.

Avoid disturbing (e.g. cultivating or mowing) treated areas for at least 7 days following application.

BAND TREATMENTS

BANVEL Herbicide may be applied as a band treatment. Use the formulas below to determine the appropriate rate and volume per treated acre.

Band width — in inches — Row width in inches	x	Broadcast RATE per treated acre	=	Band RATE per treated acre
Band width — in inches — Row width in inches	x	Broadcast VOL UME per treated acre	=	Band VOL UME per treated acre

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COMPATIBILITY TEST

Before mixing in the spray tank, it is advisable to test compatibility by mixing all components in a small container in proportionate quantities (see following table).

Amount of Herbicide to Add to One Pint of Spray Carrier
(Assuming Volume is 25 Gallons per Acre)

HERBICIDE FORMULATIONS	RATE PER ACRE	LEVEL TEASPOONS
Dry	1 lb.	1 1/2
Liquid	1 pt.	1/2

If herbicide(s) do not ball-up or form flakes, sludge, gels, oily films or layers, or other precipitates, then the tested spray mix is compatible. Usually incompatibility in any of the above described forms will occur within 5 minutes after mixing.

If components are incompatible, the use of a compatibility agent is recommended. Run the above COMPATIBILITY TEST with a suitable compatibility agent (1/4 teaspoon is equivalent to 2 pints per 100 gallons of fluid fertilizer).

GENERAL WEED LIST

This is a general list of weeds which may be treated with BANVEL Herbicide in accordance with this label as recommended under the rates and timing sections of the Individual Use Headings. Proper usage of this product will give control or growth suppression of many ANNUAL, BIENNIAL, and PERENNIAL broadleaf weeds, and many WOODY brush and vine species including:

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RON K. GRAPHIC SERVICES, LTD.

Disc 110 — File No. 04

03-17-87 cm Hel. Reg. -1; Hel. Bold-2; (114)

Job No. 0358 Sandoz Banvel Booklet
Galley 6

ANNUALS

amaranth, spiny (spiny pigweed)	amaranth, woolly	morningglory, ivyleaf
aster, slender	cucumber, wild	morningglory, tall
bedstraw	daisy, English	mustard, tansy
beggarweed, Florida	cutleaf	mustard, (yellowtops)
broomweed, common	fleabane, annual	nightshade, black
buckwheat, wild	goosetoot, nattleleaf	penycress, field
buffalobur	henbit	(fenweed)
burclover, California	limsonweed	henchweed,
burcucumber	knotweed	stinkweed)
buttercup, roughseed	kochia	pepperweed, Virginia
carpetweed	lelyshumb	(peppergrass)
catchfly, nightflowering	lambquarters,	pigweed, prostrate
chamomile, com	common	pigweed, redroot
chickweed, common	lambquarters	(cerealeweed)
clovers (annual)	(fleezine resistant)	pigweed, rough
cockle, corn	lettuce, prickly	pigweed, smooth
cockle, cow	mallow, common	pigweed
cocklebur, common	mellow Venice	(fleezine resistant)
croton, tropic	mayweed	pigweed, tumble

ANNUALS (Cont'd.)

poorloe	sicklepod	spurry, com
puncturevine	sida, prickly	starbur, bristly
purslane, common	(leafweed)	sumpweed, rough
pursley, Florida	smartweed, green	sunflower, common
radish, wild	smartweed,	(wild)
ragweed, common	Pennsylvania	sunflower, volunteer
ragweed, giant	aneezweed, bitter	thisle, Russian
(buffelweed)	sowthistle, annual	velvetleaf
rubberweed, bitter	sowthistle, spiny	waterhemp
(bitterweed)	spikeweed, common	waterprimrose, winged
sesbania, hemp	spurge, prostrate	wormwood, annual
shepherdspurse		

BIENNIALS

burdock, common	gromwell	sweatclover
carrot, wild	knapweed, diffuse	teasel
(Queen Anne's lace)	knapweed, spotted	thisle, bull
cockle, white	mallow, dwarf	thisle, milk
eveningprimrose,	plantain, bracted	thisle, musk
common	ragwort, tansy	thisle, plumeless
geranium, Carolina	starthistle, yellow	

PERENNIALS

*allia	fern, bracken	redvine
artichoke, Jerusalem	garlic, wild	smartweed, swamp
aster, spiny	goldenrod, Canada	snakeweed, trout:
elder, whiteheath	goldenrod, Missoun	*sorrel, red
bedstraw, smooth	goldenweed, common	(sheep sorrel)
bindweed, field	hawkweed	sowthistle
blindweed, hedge	horsetail, Carolina	sowthistle, perennial
blueweed, Texas	ironweed	spurge, leafy
*bursage	(burr ragweed)	sundrop, hairy:rub
(lakeweed)	knapweed, black	(eveningprimrose)
(povertyweed)	knapweed, Russian	thisle, Canada
bursage, woollyleaf	mare's tail	loadilla, Canadian
(lekeweed)	(horsetail)	trumpet, lesser
*buttercup, tall	milkweed, climbing	(buck, eye)
campan, bladder	milkweed, common	valch
chickweed, field	milkweed, honeyvine	waterhemlock
chickweed, mouseear	milkweed,	waterprimrose
chicory	western whorled	creeping
*clover, hop	nettle, stinging	*woodsorrel
*dandelion, common	nightshade, silverleaf	common yellow
*dock, broadleaf	(white horse)nettle)	wormwood, common
(bitterdock)	onion, wild	wormwood, Louisiana
*dock, curly	*plantain, broadleaf	*yankeeweed
dogbane, hemp	*plantain, buckhorn	yarrow, common
*dogfennel	pokaweed	
(cypressweed)	ragweed, western	

General Weed List (Cont'd)

* Noted perennials may be controlled using BANVEL Herbicide at rates lower than those recommended for other listed perennial weeds (See application rates and timing on pages 18-21, 23, 27, 40-41 and 61-66)

WOODY

alder	hemlock	poplar
ash	hickory	rabbitbrush
espen	honeylocust	redcedar, eastern
basswood	honeysuckle	rose, McCarley
beech	hornbeam	rose, multiflora
birch	huckleberry	sagebrush, fringed
blackberry	hulsache	sassafras
blackgum	ivy, poison	serviceberry
cedar	kudzu	spicebush
cherry	locust, black	sumac
clintquapin	maple	sweetgum
cottonwood	mesquite	sycamore
creosotebush	oak	tarbush
cucumber tree	oak, poison	willow
dewberry	olive, Russian	witchhazel
dogwood	persimmon, eastern	yaupon
elm	pine	yucca
grape	plum, sand (wild plum)	
hawthorn (thornapple)		

FIELD, SEED*, AND SILAGE CORN IMPORTANT

Observe all precautions, mixing and application instructions on pages 4-9 as well as the following:

- Do not apply BANVEL Herbicide to seed corn without first verifying with your local seed corn company (supplier) the BANVEL selectivity on your inbred line. This precaution will help avoid potential injury of sensitive varieties.

BANVEL is not registered for use on sweet corn and popcorn.

Direct chemical contact with corn seed must be avoided. If corn seeds are less than 1½ inches below the surface, delay application until corn has emerged.

Up to 2 applications of BANVEL Herbicide may be made during a growing season. Do not exceed a total of 1½ pints of BANVEL Herbicide per treated acre per crop year. Allow two weeks between applications of BANVEL Herbicide. See appropriate section for rate information. For combination options or sequential treatments, refer to appropriate section.

Applications of BANVEL Herbicide to corn during periods of rapid growth may result in temporary leaning. Corn will usually become erect within 3 to 7 days. Cultivation should be delayed until after corn is growing normally to avoid breakage.

Do not use adjuvants containing penetrants such as petroleum and crop oils after crop emergence.

Prior to the ensilage (milk) stage of the crop, do not harvest or graze corn for dairy or beef feed.

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Use coarse sprays to avoid potential herbicide drift. Select nozzles which are designed to produce minimal amounts of fine spray particles such as reindrops, LP flat fans or large capacity flood nozzles such as D10, TK10 or greater capacity tips. Keep the spray pressure at or below 20 psi and the spray volume at or above 20 gpa, unless otherwise required by the manufacturer of drift-reducing nozzles. An agriculturally approved drift control agent may be added to further reduce the potential for drift.

Several synthetic pyrethroid insecticides are labeled for tank mix applications of BANVEL. Refer to their label for specific recommendations.

WEEDS CONTROLLED

BANVEL Herbicide will control many ANNUAL broadleaf weeds or give growth suppression of many PERENNIAL broadleaf weeds commonly found in corn (Refer to the GENERAL WEED LIST on pages 9-13.)

For best performance, make application when weeds have emerged and are actively growing.

Preemergence control of cocklebur, velvetleaf, and jimsonweed may be reduced if conditions such as low temperature or lack of soil moisture cause delayed or deep germination of weeds.

Adding an agriculturally approved surfactant to BANVEL Herbicide will improve wild mustard, common sunflower, or velvetleaf control when weeds are over 5 inches tall or growing under drought stress at time of application. Tank mixing BANVEL Herbicide plus 2,4-D will improve control from a late postemergence application, but 2,4-D may cause brittleness to corn. Refer to tank mix treatments on pages 16-21.

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PREPLANT/PREEMERGENCE IN NO TILLAGE CORN

Applications of BANVEL Herbicide may be made before, during, or after planting to emerged and actively growing broadleaf weeds. Apply BANVEL Herbicide at 1 pint per treated acre on medium or fine textured soils containing 2% or greater organic matter. This rate also applies to soils containing greater than 8% organic matter. Use ½ pint per treated acre on coarse textured soils (sand, sandy loam, and loamy sand).

When planting into a legume sod (e.g., alfalfa or clover), apply BANVEL Herbicide after 4-6 inches of regrowth has occurred.

PREEMERGENCE IN CONVENTIONAL OR REDUCED TILLAGE CORN

BANVEL Herbicide may be applied after planting and prior to corn emergence. Application at 1 pint per treated acre may be made to medium or fine textured soils which contain 2% or greater organic matter. DO NOT apply to coarse textured soils.

Preemergence application of BANVEL Herbicide does not require mechanical incorporation to become active. A shallow mechanical incorporation is recommended if application is not followed by adequate rainfall or sprinkler irrigation. Avoid tillage equipment (e.g., drags, harrows) which concentrate treated soil over seed furrow.

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EARLY POSTEMERGENCE (ALL TILLAGE SYSTEMS) (Spike to 5th true leaf stage)

BANVEL Herbicide at 1 pint per treated acre may be applied during the period from corn emergence through the 5th true leaf stage or 8 inches tall, whichever comes first. Reduce the rate to ½ pint per treated acre if the crop is beyond the 8 inch stage or growing on coarse textured soils (sand, sandy loam, loamy sand).

LATE POSTEMERGENCE (ALL TILLAGE SYSTEMS) (8" to 36" tall corn)

Application of BANVEL Herbicide at ½ pint per treated acre may be made from 8 to 36 inch tall corn or 15 days before tassel emergence, whichever comes first. Make directed spray application when: (1) corn leaves prevent proper spray coverage; (2) sensitive crops are growing nearby; (3) tank mixing with 2,4-D; or (4) surfactants are added to the spray mixture.

DO NOT apply BANVEL Herbicide when soybeans are growing nearby if any of these conditions exist:

- corn is more than 24 inches tall
- soybeans are more than 10 inches tall
- soybeans have begun to bloom

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OVERLAY (SEQUENTIAL) TREATMENTS

BANVEL Herbicide may be applied to ground previously treated with one or more of the following herbicides:

alrazine
Bexion®/Ramrod (propachlor)
Bicep®
Bladex® (cyanazine)
Bronco®
Dual® (metolachlor)
Eredicene® (EPTC)
Extrazine®
Gramoxone® (paraquat)
Lesso® (alachlor)
Marksman®
Princep® (simazine)
Prowl® (pendimethalin)
Roundup® (glyphosate)
Sutan + ®/Genate® (butylate)

READ AND FOLLOW LABEL DIRECTIONS FOR EACH OF THE ABOVE PRODUCTS.

TANK MIX TREATMENTS FOR CORN

BANVEL Herbicide may be tank mixed with one or more of the following herbicides for control of grasses or additional broadleaf weeds. Read and follow the label of each tank mix product used for precautionary statements, directions for use, rates and timings, and other restrictions.

RATES AND TIMINGS					
PREPLANT/ BANVEL PLUS	PREEMERGE (NO TILLAGE CORN)	PREEMERGE (CONVENTIONAL OR REDUCED TILLAGE CORN)	EARLY POST EMERGENT ALL TILLAGE SYSTEMS)	LATE POSTEMER- GENT (ALL TILLAGE SYS- TEMS)	ADDITIONAL DIRECTIONS
1 1/4-4 lbs a/A	1 1/4-4 lbs a/A	1 1/4-4 lbs a/A	1 1/4-4 lbs a/A	1 1/4-4 lbs a/A	

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ATRAZINE	1 1/4-4 lbs a/A	1 1/4-4 lbs a/A	1 1/4-4 lbs a/A	1 1/4-4 lbs a/A	Application may be made before grasses are 1 1/2 inches tall
BLUDEX®	1 1/4-4 lbs a/A	1 1/4-4 lbs a/A	1 1/4-2 lbs a/A (use the 80W, 900F formula - bon only)	-	Application may be made before grasses are 1 1/2 inches tall and before corn is beyond the 4 true leaf stage
DUAL®	-	1 1/2-3 lbs a/A (use only on fine or medium textured soils with 2 1/2% or greater organic matter)	1 1/2-3 lbs a/A	-	Application may be made after planting and until grasses reach the 2 leaf stage and before corn is greater than 3 inches tall

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ION K GRAPHIC SERVICES, LTD.
ISC 127 — File No. 43
11-87 cm Reg Reg -1, Hel. Bld -2 (114)
Job No. 0358 Banvel Booklet
alley 04

RATES AND TIMINGS

PREPLANT/ BANVEL® PLUS	PREEMERGE (NO TILLAGE CORN)	PREEMERGE (CONVENTIONAL OR REDUCED TILLAGE CORN)	EARLY POST EMERGENT ALL TILLAGE SYSTEMS)	LATE POSTEMER- GENT (ALL TILLAGE SYS- TEMS)	ADDITIONAL DIRECTIONS
LASSO®	1 1/2-4 lbs a/A (use only on fine textured soils greater than 2 1/2% organic matter)	1 1/2-4 lbs a/A (use only on fine textured soils with greater than 2 1/2% organic matter)	1 1/2-4 lbs a/A	-	Application may be made before grasses reach the 2 leaf stage and before corn is greater than 3 inches tall
PARAQUAT	1/4-1 lb a/A	1/4-1 lb a/A	-	-	Application may be made to emerged weeds but prior to corn emergence
PRINCEP®	2 0-3 0 lbs a/A	2 0-3 0 lbs a/A	-	-	Application may be made prior to weed and corn emergence
PROWL®	-	1 0-2 0 lbs a/A	-	-	Application may be made immediately after planting but prior to weed and corn emergence
ROUNDUP®	1 0-3 0 lbs a/A	1 0-3 0 lbs a/A	-	-	Application may be made to emerged weeds but prior to corn emergence
2,4-D	1/4-1/2 lbs a/A	1/4-1/2 lbs a/A	Hot recom method	1/4 lb a/A	Drop tapes are to be used when corn reaches the 3" growth stage keeping the spray off the corn leaves and out of the whorl will reduce the likelihood of crop injury and improve spray coverage of weed foliage

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RONK GRAPHICS, LTD.
DISC 110 — File No 14
04-15-86 gk Hel. Reg -1, Hel. Bld -2 (114)
Job No 0290 Velsicol Banvel Booklet
G-111-11-16

GRAIN SORGHUM (Milo) IMPORTANT

OBSERVE ALL PRECAUTIONS ON PAGES 4-5.
(Including the Reference To Crops Growing Under Stress)
**READ AND FOLLOW MIXING AND APPLICATION
INSTRUCTIONS ON PAGES 7-8.**

Applications of BANVEL Herbicide to sorghum during periods of rapid growth may result in temporary leaning of plants or rolling of leaves. These effects are usually outgrown within 10 to 14 days.

Do not graze or feed treated sorghum forage or silage prior to mature grain stage.

Do not apply BANVEL Herbicide to sorghum grown for seed production.

Make no more than one application per growing season.

Delay harvest until 30 days after treatment.

WEEDS CONTROLLED

BANVEL Herbicide, when applied at the recommended rate for grain sorghum, will control many actively growing ANNUAL broadleaf weeds and will reduce competition from established PERENNIAL broadleaf weeds as well as control their seedlings. (Refer to GENERAL WEED LIST on pages 9-13).

RATES AND TIMINGS

BANVEL Herbicide may be applied to emerged and actively growing weeds at least 15 days prior to planting. Postemergence application of BANVEL Herbicide must be made after sorghum is in the 3 leaf stage but before sorghum is 15 inches tall. For best performance, make applications when sorghum is in the 3-5 leaf stage and weeds are small (less than 3 inches tall). Use drop pipes (drop nozzles) if crop is taller than 8 inches. Keeping the spray off the sorghum leaves and out of the whorl will reduce the likelihood of crop injury and improve spray coverage of weed foliage.

BROADCAST RATE PER TREATED ACRE: 1/2 pint (1/4 lb. a.i.)

TANK MIX TREATMENT

BANVEL PLUS ATRAZINE. For improved control of emerged, actively growing broadleaf weeds including triazine resistant species and added suppression of perennial broadleaf weeds, tank mix 1/2 pint BANVEL Herbicide with 0.5 to 1.25 lbs. a.i. atrazine per treated acre. For control of grasses (less than 1.5 inches tall), tank mix 1/2 pint BANVEL Herbicide with 2.3 lbs. a.i. atrazine per treated acre. For best performance and minimal crop injury, make application when sorghum is 3-8 inches tall and when broadleaf weeds are small (less than 6 inches tall). The atrazine rate will depend upon soil texture and length of residual weed control desired.

READ AND FOLLOW THE LABEL OF EACH TANK MIX PRODUCT USED FOR PRECAUTIONARY STATEMENTS, DIRECTIONS FOR USE, APPLICATION RATES AND TIMINGS AND OTHER RESTRICTIONS.

OVERLAY (SEQUENTIAL) TREATMENTS

BANVEL Herbicide may be applied to ground previously treated with one or more of the following herbicides:

Herbicide	Maximum rate per treated acre (lb. a.i.)
alachlor (Lasso*) (Screen*-treated seed)	4
elrazine	3
metolachlor (Dual*) (Concept*-treated seed)	2.5
propachlor (Ramrod*)	5
propazine (Milogard*)	3.2

PREHARVEST USES

**For Use Only in the States
of Texas and Oklahoma**

Application of BANVEL Herbicide may be made any time after the sorghum has reached the soft dough stage of development for suppression of weeds. An agriculturally approved surfactant may be used to improve performance.

BROADCAST RATE PER TREATED ACRE: 1/2 pint (1/4 lb. a.i.)

SMALL GRAINS (NOT UNDERSEED TO LEGUMES) IMPORTANT

**OBSERVE ALL PRECAUTIONS ON PAGES 4-5.
READ AND FOLLOW MIXING AND APPLICATION
INSTRUCTIONS ON PAGES 7-8.**

If small grains are grown for pasture only, refer to the PASTURE, RANGELAND and NON CROPLAND section pages 37-45.

Do not graze or harvest for livestock feed prior to crop maturity.

WEEDS CONTROLLED

BANVEL Herbicide, when applied at recommended rates, will control ANNUAL broadleaf weeds commonly found in small grains, such as:

buckwheat, wild chamomile, corn cockle, corn cockle, cow cocklebur, common henbit knotweed kochia	ladythumb lambsquarters, common mallow, common nightshade, black pennycress, field pigweed, redroot (carelessweed) pigweed, rough
--	--

Weed Controlled (Cont.)

pigweed, tumble
 ragweed, common
 ragweed, giant (buffaloweed)
 smartweed, green
 smartweed, Pennsylvania
 sowthistle, annual
 sunflower, common (wild)
 sunflower, volunteer
 thistle, Russian
 velvetleaf

BANVEL Herbicide and BANVEL Herbicide tank mixes will reduce competition from established PERENNIAL broadleaf weeds and control their seedlings. (Refer to GENERAL WEED LIST on pages 9-13).

THE SPECIAL USE TANK MIX FOR FALL SEEDED WHEAT ONLY allows a higher rate of 2,4-D to be used in combination with BANVEL Herbicide. This tank mix treatment may be used for improved performance of difficult-to-control weeds including:

*lidlneck (larweed) groomwell
 garlic, wild onion, wild

• Spring applications may not control weeds that develop in the fall. For fall applications, refer to the BETWEEN CROPPING APPLICATIONS section, pages 61-66.

RATES AND TIMINGS

Application of BANVEL Herbicide may be made before, during or after planting to emerged and actively growing weeds. See specific crop for timing restrictions. For best performance, make application when weeds are in the 2-3 leaf stage and rosettes are less than 2 inches across. Use the higher level of listed rate ranges when treating more mature weeds or dense vegetative growth. Surfactant should not be used when applying BANVEL Herbicide alone or in a tank mix on small grains except when tank mixing with chlorosulfuron (Glean), metsulfuron (Ally) or Finesse.

FALL SEEDED WHEAT

BANVEL HERBICIDE MUST BE APPLIED TO FALL SEEDED WHEAT PRIOR TO THE JOINTING STAGE.

BROADCAST RATE PER TREATED ACRE: 1/4 pint (1/8 lb. e.i.)

TANK MIX TREATMENTS

For control of grasses or additional broadleaf weeds, BANVEL Herbicide may be tank mixed with the following herbicides. Read and follow the label of each tank mix product used for precautionary statements, directions for use, weeds controlled and geographic and other restrictions.

BROADCAST RATE PER TREATED ACRE:

Apply 1/8-1/4 pint (1/16-1/8 lb. a.i.) BANVEL Herbicide with:

Herbicide	amount product*	lb. a.i.
2,4-D	1/2-3/4 pint	1/4-3/8
MCPA	1/2-3/4 pint	1/4-3/8
bromoxynil		
(Brominal ME4,	1/2-3/4 pint	1/4-3/8
Buctril)	1-1 1/2 pint	1/2-3/8
bromoxynil + MCPA		
(Bronale,	1 pint	1/4 + 1/4
Brominal Plus)	1 pint	1/4 + 1/4
metsulfuron (Ally)*,***	1/10 wt oz	0.0038
metribuzin		
(Sencor® 75 DF** , Lexone® DF™)	1/8-1/4 lb	1/8-1/4
(Sencor® 4** , Lexone® 4L)	1/4-1/2 pint	1/8-1/4
(Lexone® 50WP)	1/4-1/2 lb	1/8-1/4
chlorosulfuron***		
(Glean® 75 DF)	1/8-1/2 wt oz.	0.008-0.024
diuron (Karmex® 80WP)	1/2-2 lbs	3/8-1 1/8
terbutryn (Igran® 80W)	1 1/2-2 3/4 lbs	1 1/8-2 1/8
Finesse®****	0.3-0.5 wt oz	-

• Based on 4 pounds per gallon formulations of MCPA and 2,4-D
 • Application may be made after fall seeded wheat has started to grow and has a well established secondary root system or is beginning to tiller, but prior to the jointing stage.
 • When making tank mix applications with Glean, add a surfactant of at least 80% active ingredient at the rate of 1-2 quarts/100 gallons of spray or not more than 1/4-1/2% by volume. Use the higher rate of surfactant when using the lower rate ranges of the tank mix and/or when treating more mature weeds or dense vegetative growth.
 • Use 0.25% surfactant per treated acre for improved control of broadleaf weeds.

SPECIAL USE TANK MIX FOR FALL SEEDED WHEAT ONLY

BANVEL	1/4 pint	1/8 lb. e.i.
plus	plus	plus
2,4-D enline	1 to 2 pints	1/2 to 1 lb. e.i.
or	or	or
2,4-D ester	1 to 1 1/2 pints	1/2 to 3/4 lb. a.i.

Note: Do not use unless possible crop injury will be acceptable

SPRING SEEDED WHEAT

BANVEL HERBICIDE MUST BE APPLIED BEFORE SPRING SEEDED WHEAT EXCEEDS THE 5 LEAF STAGE.

BROADCAST RATE PER TREATED ACRE: $\frac{1}{2}$ pint ($\frac{1}{16}$ lb. a.i.)

TANK MIX TREATMENTS

For control of additional broadleaf weeds, BANVEL Herbicide may be tank mixed with the following herbicides. Read and follow the label of each tank mix product used for precautionary statements, directions for use, weeds controlled and geographic and other restrictions.

BROADCAST RATE PER TREATED ACRE:

Apply $\frac{1}{8}$ - $\frac{1}{4}$ pint ($\frac{1}{16}$ - $\frac{1}{8}$ lb. a.i.) BANVEL Herbicide with:

Herbicide	amount product*	lb. a.i.
2,4-D	$\frac{1}{2}$ - $\frac{3}{4}$ pint	$\frac{1}{4}$ - $\frac{3}{8}$
MCPA	$\frac{1}{2}$ - $\frac{3}{4}$ pint	$\frac{1}{4}$ - $\frac{3}{8}$
bromoxynil (Brominal, Buctril)	$\frac{1}{2}$ - $\frac{3}{4}$ pint 1-1 $\frac{1}{2}$ pint	$\frac{1}{4}$ - $\frac{3}{8}$ $\frac{1}{4}$ - $\frac{3}{8}$
chlorsulfuron** (Glean® 75 DF)	$\frac{1}{16}$ - $\frac{1}{8}$ wt. oz.	0.008-0.024
Flinaza***	0.3-0.5 wt. oz.	-
metalsulfuron (Ally®)***	$\frac{1}{10}$ wt. oz.	0.0038

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- * Based on 4 pounds per gallon formulations of MCPA and 2,4-D.
- ** When making tank mix applications with Glean, add a surfactant of at least 80% active ingredient at the rate of 1-2 quarts per 100 gallons of spray or not more than $\frac{1}{4}$ - $\frac{1}{2}$ % by volume. Use the higher rate of surfactant when using the lower rate ranges of the tank mix and/or when treating more mature weeds or dense vegetative growth.
- *** Use 0.25% surfactant per treated acre for improved control of broadleaf weeds.

FALL SEEDED BARLEY

BANVEL HERBICIDE MUST BE APPLIED TO FALL SEEDED BARLEY PRIOR TO THE JOINTING STAGE.

Note: For fall barley varieties that are seeded during the winter months or later, follow the rates and timings given for Spring Seeded Barley.

BROADCAST RATE PER TREATED ACRE: $\frac{1}{4}$ pint ($\frac{1}{16}$ lb. a.i.)

TANK MIX TREATMENTS

For control of additional broadleaf weeds, BANVEL Herbicide may be tank mixed with the following herbicides. Read and follow the label of each tank mix product used for precautionary statements, directions for use, weeds controlled and geographic and other restrictions.

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RON K. GRAPHIC SERVICES, LTD.

DISC 127 — File No. 53

3-12-87 cm Heg Reg -1, Hel Bld -2(114)

Job No. 0358 Banvel Booklet

Galley 08

BROADCAST RATE PER TREATED ACRE:
Apply $\frac{1}{8}$ - $\frac{1}{4}$ pint ($\frac{1}{16}$ - $\frac{1}{8}$ lb. a.i.) BANVEL Herbicide with:

Herbicide	amount product*	lb. a.i.
2,4-D	$\frac{1}{2}$ pint	$\frac{1}{4}$
MCPA	$\frac{1}{2}$ - $\frac{3}{4}$ pint	$\frac{1}{4}$ - $\frac{3}{8}$
chlorsulfuron** (Glean® 75 DF)	$\frac{1}{16}$ - $\frac{1}{8}$ wt. oz.	0.008-0.024
metribuzin	$\frac{1}{10}$ wt. oz.	0.0038
Sencor 4	$\frac{1}{2}$ -1 pint	$\frac{1}{4}$ - $\frac{1}{2}$
Sencor 75 DF	$\frac{1}{2}$ - $\frac{3}{4}$ pound	$\frac{1}{4}$ - $\frac{1}{2}$

- * Based on 4 pounds per gallon formulations of MCPA and 2,4-D.
- ** When making tank mix applications with Glean, add a surfactant of at least 80% active ingredient at the rate of 1-2 quarts/100 gallons of spray or not more than $\frac{1}{4}$ - $\frac{1}{2}$ % by volume. Use the highest rate of surfactant when using the lower rate ranges of the tank mix and/or when treating more mature weeds or dense vegetative growth.
- *** Use 0.25% surfactant per treated acre for improved control of broadleaf weeds.

SPRING SEEDED BARLEY

BANVEL HERBICIDE MUST BE APPLIED BEFORE SPRING SEEDED BARLEY EXCEEDS THE 3 LEAF STAGE.

BROADCAST RATE PER TREATED ACRE: $\frac{3}{16}$ pint ($\frac{3}{32}$ lb. a.i.)

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TANK MIX TREATMENTS

For control of additional broadleaf weeds, BANVEL Herbicide may be tank mixed with the following herbicides. Read and follow the label of each tank mix product used for precautionary statements, directions for use, weeds controlled and geographic and other restrictions.

BROADCAST RATE PER TREATED ACRE:

Apply $\frac{1}{8}$ - $\frac{3}{16}$ pint ($\frac{1}{16}$ - $\frac{3}{32}$ lb. a.i.) BANVEL Herbicide with:

Herbicide	amount product*	lb. a.i.
MCPA	$\frac{1}{2}$ pint	$\frac{1}{4}$
metribuzin (Sencor 4)	$\frac{1}{2}$ pint	$\frac{1}{4}$
(Sencor 75 DF)	$\frac{1}{2}$ pound	$\frac{1}{4}$
chlorsulfuron** (Glean® 75 DF)	$\frac{1}{16}$ - $\frac{1}{8}$ wt. oz.	0.008-0.024
metalsulfuron (Ally®)***	$\frac{1}{10}$ wt. oz.	0.0038

- * Based on 4 pounds per gallon formulations of MCPA.
- ** When making tank mix applications with Glean, add a surfactant of at least 80% active ingredient at the rate of 1-2 quarts/100 gallons of spray or not more than $\frac{1}{4}$ - $\frac{1}{2}$ % by volume. Use the highest rate of surfactant when using the lower rate ranges of the tank mix and/or when treating more mature weeds or dense vegetative growth.
- *** Use 0.25% surfactant for improved control of broadleaf weeds.

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RON K. GRAPHIC SERVICES, LTD.

DISC 127 — File No. 61

3-12-87 cm Heg Reg -1, Hel Bld -2(114)

Job No. 0358 Banvel Booklet

Galley 09

RON K. GRAPHIC SERVICES, LTD.

FALL AND SPRING SEEDED OATS

BANVEL HERBICIDE MUST BE APPLIED BEFORE SPRING SEEDED OATS EXCEED THE 5 LEAF STAGE. APPLICATIONS TO FALL SEEDED OATS MUST BE MADE PRIOR TO THE JOINTING STAGE.

BROADCAST RATE PER TREATED ACRE: $\frac{1}{4}$ pint ($\frac{1}{8}$ lb. a.i.)

TANK MIX TREATMENTS

For control of additional broadleaf weeds, BANVEL Herbicide may be tank mixed with the following herbicides. Read and follow the label of each tank mix product used for precautionary statements, directions for use, weeds controlled and geographic and other restrictions.

BROADCAST RATE PER TREATED ACRE:

Apply $\frac{1}{8}$ - $\frac{1}{4}$ pint ($\frac{1}{16}$ - $\frac{1}{8}$ lb. a.i.) BANVEL Herbicide with:

Herbicide	amount product*	lb. a.i.
MCPA	$\frac{1}{2}$ - $\frac{3}{4}$ pint	$\frac{1}{4}$ - $\frac{3}{8}$

* Based on 4 pounds per gallon formulations of MCPA.

SUGARCANE IMPORTANT

OBSERVE ALL PRECAUTIONS ON PAGES 4-5.
READ AND FOLLOW MIXING AND
APPLICATION INSTRUCTIONS ON PAGES 7-8.

Consult your local or state authorities for possible application restrictions, especially concerning aerial applications and advice concerning special local use situations.

WEEDS CONTROLLED

BANVEL Herbicide, when applied at recommended rates, will control many ANNUAL, BIENNIAL and PERENNIAL broadleaf weeds commonly found in sugarcane. (Refer to GENERAL WEED LIST on pages 9-13).

RATES AND TIMINGS

Application of BANVEL Herbicide may be made any time after weeds have emerged and are actively growing but before the close in stage of sugarcane. Application rates and timings of BANVEL Herbicide are given below. Use the higher level of listed rate ranges when treating dense vegetative growth.

WEED STAGE & TYPE	amount	Broadcast rate per treated acre	
		lbs. a.i.	lbs. a.i.
Annual Small, actively growing Established weed growth	$\frac{1}{2}$ - 1 pt. 1 - $1\frac{1}{2}$ pts	$\frac{1}{4}$ - $\frac{1}{2}$ $\frac{1}{2}$ - $\frac{3}{4}$	
Biennial	1 - 2 pts.	$\frac{1}{2}$ - 1	
Perennial Noted(*) Perennials Other Perennials	2 - 4 pts 4 - 6 pts.	1 - 2 2 - 3†	

† Application made over the top of actively growing sugarcane may result in crop injury.

When possible, direct the spray beneath the sugarcane canopy in order to minimize the likelihood of crop injury. The use of directed sprays will also aid in maximizing spray coverage of weed foliage.

Retreatments may be made as needed, however, do not exceed a total of 6 pints (3 lbs. a.i.) of BANVEL Herbicide per treated acre during a growing season.

TANK MIX TREATMENTS

BANVEL Herbicide may be tank mixed with one or more of the following herbicides for control of grasses or additional broadleaf weeds. Read and follow the label of each tank mix product used for precautionary statements, directions for use, rates and timings, weeds controlled, geographic and other restrictions.

Herbicide	Rates per treated acre (lbs. a.i.)
emetryn (Evik*)	$\frac{2}{3}$ to 8
asulam (Asulox*)	2 to $3\frac{1}{2}$
atrazine	$\frac{2}{3}$ to 4
dalapon (Dalapon*)	$3\frac{1}{2}$ to $8\frac{1}{2}$
2,4-D	$\frac{1}{2}$ to 3*

* Application of BANVEL Herbicide plus 2,4-D tank mix at the higher listed rate ranges may result in crop injury.

PASTURE, RANGELAND AND NON-CROPLAND AREAS

BANVEL Herbicide is recommended for use on pasture, rangeland, general farmstead weed and brush control and for use on non-cropland areas such as fence rows, roadways, rights-of-way (utility, railroad, highway, pipeline), non-selective forest brush control (including site preparation), wasteland and other non-cropland areas.

IMPORTANT

OBSERVE ALL PRECAUTIONS ON PAGES 4-5.
READ AND FOLLOW MIXING AND
APPLICATION INSTRUCTIONS ON PAGES 7-8.

BANVEL Herbicide uses described in this section also pertain to small grains such as barley, oats, rye or wheat grown for pasture use only.

NEWLY SEEDED AREAS. Including small grains such as barley, oats, rye or wheat grown for pasture, may be severely injured if rates of BANVEL Herbicide are applied in excess of those listed for control of ANNUAL weeds.

ESTABLISHED GRASS CROPS growing under stress can exhibit various injury symptoms that may be more pronounced if herbicides are applied. Furthermore, rates of BANVEL Herbicide in excess of 2 quarts (2 lbs. a.i.) per treated acre may cause temporary injury to many grass species.

Bentgrass, carpetgrass, buffalograss and St. Augustine grass may be injured at rates exceeding 1 pint BANVEL Herbicide (1/2 lb. a.i.) per treated acre. Usually colonial bentgrasses are more tolerant than creeping types. Velvetgrasses are most easily injured. Treatments will kill or injure alfalfa, clovers, lespedeza, wild winter peas, vetch and other legumes.

REMOVE MEAT ANIMALS FROM TREATED AREAS 30 DAYS PRIOR TO SLAUGHTER.

THERE IS NO WAITING PERIOD BETWEEN TREATMENT AND GRAZING FOR NON-LACTATING ANIMALS.

TIMING RESTRICTIONS FOR LACTATING DAIRY ANIMALS FOLLOWING TREATMENT

BANVEL Herbicide Rate per Treated Acre	Days Before Grazing	Days Before Hay Harvest
Up to 1 pint (1/2 lb. a.i.)	7 days	37 days
Up to 1 quart (1 lb. a.i.)	21 days	51 days
Up to 2 quarts (2 lbs. a.i.)	40 days	70 days
Up to 8 quarts (8 lbs. a.i.)	60 days	90 days

Note: Observe all precautions and restrictions on labels of products used in tank mixtures.

MIXING AND APPLICATION

BANVEL Herbicide can be applied using water, oil in water emulsions (including inert systems), or spraying liquid fertilizer as a carrier. A COMPATIBILITY TEST (page 9 of this booklet) should be made prior to tank mixing.

To prepare oil in water emulsions, half-fill spray tank with water plus appropriate amount of herbicide. With continuous agitation, slowly add a premix of oil (such as diesel oil or fuel oil) plus a suitable emulsifier to spray tank. Complete filling of spray tank with water. Maintain vigorous agitation during spray operation to prevent oil and water from forming separate layers.

BANVEL Herbicide may be applied broadcast using either ground or aerial application equipment. When using ground equipment, apply 5 to 600 gallons of diluted spray per treated acre. Volume of spray applied will depend on the height, density, and type of weeds or brush being treated and on the type of

equipment being used. When using aerial equipment apply 3 to 40 gallons of diluted spray per treated acre.

BANVEL Herbicide may be applied to individual clumps or small areas (SPOT TREATMENT) of undesirable vegetation using handgun or similar types of application equipment. Apply diluted sprays to allow complete wetting (up to runoff) of foliage and stems.

ACCUTROL® Herbicide adjuvant or other spray additives (emulsifiers, surfactants, wetting agents, drift control agents, or penetrants) may be used for wetting, penetration, or drift control. Spray additives must be agriculturally approved when used in pasture applications. If spray additives are used, read and follow all use recommendations and precautions on product label.

WEEDS CONTROLLED

BANVEL Herbicide, when applied at recommended rates, will give control of many ANNUAL, BIENNIAL, and PERENNIAL broadleaf weeds, and many WOODY brush and vine species commonly found in pasture, rangeland and non-cropland areas. (Refer to GENERAL WEED LIST on pages 9-13.) Noted (*) PERENNIAL weeds may be controlled with lower rates of either BANVEL Herbicide or BANVEL Herbicide plus 2,4-D. See RATES AND TIMINGS below.

RATES AND TIMINGS

Application rates and timing of BANVEL Herbicide are given below. Use the higher level of listed rate ranges when treating dense or tall vegetative growth.

WEED STAGE & TYPE	Broadcast rate per treated acre	
	amount	lbs. a.i.
Annual		
Small, actively growing	1/2-1 pt.	1/4-1/2
Established weed growth	1-1 1/2 pts.	1/2-3/4
† Biennial		
Rosette diameter		
Less than 3 inches	1/2-1 pt.	1/4-1/2
3 inches or more	1-2 pts.	1/2-1
Bolling	2-3 pts.	1-1 1/2
Perennial		
Suppression or top growth control	1/2-1 qt.	1/2-1
Noted (*) Perennials	1-2 qts.	1-2
Other perennials	2-4 qts.	2-4
Dense stands	4-6 qts.	4-6
Woody Brush & Vines		
Foliage Suppression	1/2-1 qt.	1/2-1
Stems	1-2 qts.	1-2
Stems and Stem Sprouts	1/2-1 gal.	2-4
Stems and Root Sprouts	1-2 gals.	4-8

† For best performance, make application when BIENNIAL WEEDS are in the rosette stage.

Retreatments may be made as needed, however, do not exceed a total of 2 gallons (8 lbs. a.i.) of BANVEL Herbicide per treated acre during a growing season.

TANK MIX TREATMENTS

READ AND FOLLOW THE LABEL OF EACH TANK MIX PRODUCT USED FOR PRECAUTIONARY STATEMENTS, DIRECTIONS FOR USE, APPLICATION RATES AND OTHER RESTRICTIONS. BANVEL Herbicide may be tank mixed with one or more of the following herbicides for control of grasses, additional broadleaf weeds, and woody brush and vines.

Herbicide	Rates per treated acre (lbs. a.i.)
Pasture, rangeland, and non-cropland use:	
atrazine	1/2 to 2
diuron (Karmex®)	4 to 48
glyphosate (Roundup®)	3/4 to 3 3/4
simazine (Princep®)	5 to 40
paraquat	1/2 to 1
triclopyr (Garlon®)	3/4 to 9
2,4-D	1/4 to 6
Rangeland and non-cropland use only:	
picloram (Tordon®)	1/4 to 3
2,4,5-T	1/4 to 6
Non-cropland use only:	
amitrole	2 to 8
atrazol (Atrazol®)	4 1/2 to 40
bromacil (Hyvar®)	1 1/2 to 24
dalapon (Dalapon®)	4 1/4 to 12 3/4
diquat	1/2
fosamine ammonium (Krenite®)	6 to 12

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hexazinone (Velpar®)	2 to 12
MSMA	2
prometon (Pramitol®)	10 to 60
sulfometuron methyl (Oust™)	0.14 to 0.56
tebuthiuron (Spike®)	1 to 16
2,4-DP (Weedone®)	1/2 to 11

Due to the variations that may occur in formulated products and specific use ingredients (e.g. water supplies), a COMPATIBILITY TEST as described on page 9 is recommended prior to actual tank mixing.

CUT SURFACE TREE TREATMENTS

BANVEL Herbicide may be applied as a cut surface treatment for control of unwanted trees and prevention of sprouts of cut trees. A mix of 1 part BANVEL Herbicide with 1 to 3 parts water should be used in application. Use the lower dilution when treating difficult-to-control species.

• **FRILL OR GIRDLE TREATMENTS***: Make a continuous cut or a series of overlapping cuts using an axe to girdle tree trunk. Spray or paint cut surface with the BANVEL Herbicide/water mix.

• **STUMP TREATMENTS**: Spray or paint freshly cut surface with the BANVEL Herbicide/water mix. The area adjacent to the bark should be thoroughly wet.

*Note: For more rapid foliar effects, 2,4-D may be added to the BANVEL Herbicide/water mix.

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DORMANT APPLICATIONS FOR CONTROL OF MULTIFLORA ROSE

BANVEL Herbicide can be applied when plants are dormant as an applied SPOT-CONCENTRATE directly to the soil or as a LO-OIL BASAL BARK TREATMENT using an oil/water emulsion solution.

MIXING AND APPLICATION

SPOT-CONCENTRATE applications of BANVEL Herbicide should be applied directly to the soil as close as possible to the root crown but within 2 inches of the crown. On sloping terrain, application should be made to the uphill side of the crown. Do not make application when snow or water prevents applying BANVEL Herbicide directly to the soil.

LO-OIL BASAL BARK applications of BANVEL Herbicide should be applied to the basal stem region from the ground line up to a height of 12 inches. Spray until runoff, with special emphasis on covering the root crown. For best results, make application when plants are dormant. Do not make application after bud break or when plants are showing signs of active growth. Do not make application when snow or water prevents applying BANVEL Herbicide to the ground line.

NOTE: To prepare oil in water emulsions, half fill spray tank with water plus appropriate amount of herbicide. With continuous agitation, slowly add 2 parts of oil plus a suitable emulsifier to the spray tank. Complete filling of spray tank with water. Maintain vigorous agitation during spray operation to prevent oil and water from forming separate layers.

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RATES AND TIMINGS

Application rates of BANVEL Herbicide are given below

Canopy diameter (feet)	SPOT CONCENTRATE TREATMENT BANVEL Herbicide (ounces)
5	1
10	1
15	2

Do not exceed a total of 2 gallons (8 lbs. a.i.) of BANVEL Herbicide per acre per year.

LO-OIL BASAL BARK TREATMENT

Mix the appropriate amount of BANVEL Herbicide with the appropriate amount of water, emulsifier and No. 2 diesel fuel to obtain the volume of spray desired. See table below. Refer to MIXING and APPLICATION section before mixing. Do not exceed 30 gallons of spray solution per acre per year.

Volume of spray solution desired (gal.)	Water	Emulsifier	Banvel Herbicide (ounces)	No. 2 Diesel Fuel
1	100* (3 qts.)	1/2	8	20
2	200 (6 qts.)	1	16	40
5	500 (3.75 gals.)	2 1/2	40	100
10	1000 (7.5 gals.)	5	80	200

*Conversion: 100 ounces = 3 quarts

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Newly Seeded Areas—Seedling grasses or small grains such as barley, oats, rye, wheat, or other grass species grown as a cover crop may be severely injured, if rates of BANVEL Herbicide are applied in excess of those listed for control of annual weeds. **DO NOT APPLY BANVEL HERBICIDE TO SEEDLING GRASSES UNTIL GRASSES EXCEED THE THREE-LEAF STAGE OF GROWTH.**

Established grass stands growing under stress can exhibit various injury symptoms that may be more pronounced if herbicides are applied. Benlgrass, a perennial grass, smooth brome, buffalograss, and St. Augustine grass may be injured at rates exceeding 1 pint of BANVEL Herbicide (0.5 lb a.i.) per treated acre. Depending on the rate used, treatment with BANVEL Herbicide will injure *L. virgatus*, *L. clavatus*, *L. lespedeza*, wild winter peas, vetch or other legumes.

BANVEL Herbicide can be applied using water, oil in water emulsions (including invert systems), or sprayable fluid fertilizer as a carrier. A COMPATIBILITY TEST (see page 9) should be made prior to tank mixing.

BANVEL Herbicide may be applied broadcast using either ground or aerial equipment. When using ground equipment, apply 5-50 gallons of diluted spray per treated acre. The volume of spray applied will depend on the height, density, and types of weeds being treated and the type of equipment being used. When using aerial equipment, apply 3-10 gallons of diluted spray per treated acre.

BANVEL Herbicide may be applied to individual clumps or small areas (SPOT TREATMENT) of weeds using a handgun or similar application equipment. A 100:1 diluted sprays to allow complete wetting (up to runoff) of foliage and stems.

Agriculturally approved drift-reducing additives or surfactants may be used. If spray additives are used, read and follow all use recommendations and precautions on product label. Do not use adjuvants containing penetrants such as petroleum and crop oils after cover crop emergence.

BANVEL Herbicide, when applied at recommended rates, will control many annual and biennial weeds and provide top growth control of many perennial weeds. Many of the key broadleaf weed species controlled or suppressed (perennials) are listed below.

For perennial broadleaf suppression in established grass or in the fallow (stubble) or cover crop period prior to seeding a grass crop, apply 1 quart (1 liter) of BANVEL Herbicide per treated acre. Established grass is defined as: Grass that is treated the season after planting.

buckwheat, wild	mellow, common
chamomile, corn	nightshade, black
cockle, corn	pennycress, field
cockle, cow	pigweed, redroot
cocklebur, common	pigweed, rough
henbit	pigweed, tumble
knitweed	ragweed, common
kochia	ragweed, giant (buffaloweed)
ladysthumb	smartweed, green
lambsquarters, common	

knappweed, diffuse
knappweed, spotted
starthistle, yellow
sweetclover

alfalfa (volunteer)
 artichoke, Jerusalem
 bindweed, field
 bindweed, hedge
 blueweed, Texas
 bur sage
 (bur ragweed)
 (povertyweed)
 (lakeweed)
 dandelion, common
 dock, curly
 doobane, hemp

RATES AND TIMINGS

Application rates and timing of BANVEL Herbicide treatment are given below. Use the higher rate of the rate range when vegetation is either dense or tall, or when weeds are growing under stressed conditions such as drought or cool temperature.

The addition of an agriculturally approved surfactant will improve wetting and coverage of weed foliage and improve control of drought stressed weeds.

Weed Type & Stage	Broadcast Rate Per Treated Acre	
	Amount of Formulated BANVEL Herbicide	Equivalent lbs a.i.
-----plants-----		
Annuals		
-Small actively growing	1/4 to 1	1/4 to 1/2
-Established weed growth	1	1/2
Biennials*		
-Rosette diameter		
a) less than 3 inches	1/2 to 1	1/4 to 1/2
b) 3 inches or greater	1 to 2	1/2 to 1
c) bolting biennial	2 to 3	1 to 1 1/2
Perennials*		
Suppression/Control	2 to 4	1 to 2

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* For best results, treat Biennial weeds with BANVEL Herbicide when they are in the rosette stage of growth. Retreatments may be made as needed; however, DO NOT EXCEED A TOTAL OF 2 QUARTS (2 lbs a.i.) of BANVEL Herbicide per treated acre during a growing season.

* Biennial and Perennial weeds will require follow-up (sequential) treatments for seedling control and escapes.

TANK MIX TREATMENTS

READ AND FOLLOW THE LABEL OF EACH TANK MIX PRODUCT USED FOR PRECAUTIONARY STATEMENTS, DIRECTIONS FOR USE, APPLICATION RATES, AND OTHER RESTRICTIONS.

BANVEL Herbicide may be tank mixed with one or more of the following herbicides for control of grasses or additional broadleaf weeds.

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Tank Mix Herbicide	Rates Per Treated Acre (lbs a.i.)
Atrezine*	1/2 to 2
chlorsulfuron (Glean 75DF)**	0.008 to 0.024
Glyphosate (Roundup)*	1/2 to 2
2,4-D	1/4 to 6
metolachlor (Ally)**	0.0038
Paraquat*	1/2 to 1

* Preplant application

** When making tank mix applications with Glean, add a surfactant of at least 80% active ingredient at the rate of 1-2 quarts/100 gallons of spray or not more than 1/4-1/2% by volume. Use the highest rate of surfactant when using the lower rate ranges of the tank mix and/or when treating more mature weeds or dense vegetative growth.

*** Use 0.25% surfactant per treated acre for improved control of broadleaf weeds.

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CAUTION

When used as a preplant application for control of existing weeds, allow 45 days per pint of BANVEL Herbicide applied per acre before seeding grass west of the Mississippi River, or 20 days per pint east of the Mississippi River. Exclude days when the ground is frozen. Do not apply prior to planting of grass legume mixtures.

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ASPARAGUS

For Use Only in the States of California, Oregon and Washington

IMPORTANT

OBSERVE ALL PRECAUTIONS ON PAGES 4-5.
READ AND FOLLOW MIXING AND
APPLICATION INSTRUCTIONS ON PAGES 7-8.

If spray contacts emerged spears, crooking (twisting) of some spears may result. If such crooking occurs, discard affected spears.
Do not harvest prior to 24 hours after treatment.
Make only one application per season.

RATES AND TIMINGS

Apply BANVEL Herbicide to emerged and actively growing weeds in 40 to 60 gallons of diluted spray per treated acre immediately after cutting the field, but at least 24 hours before the next cutting.

WEEDS	Rate Per Treated Acre
mustard, black pigweed, redroot (carelessweed) sowthistle, annual *thistle, Canada thistle, Russian	1/2 to 1 pt. (1/4-1/2 lb. a.i.)

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*bindweed, field chickweed, common goosefoot, nettleleaf radish, wild thistle, milk	1 pt. (1/2 lb. a.i.)
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BANVEL Herbicide plus 2,4-D herbicide tank mixture may be used for improved control of noted (*) weeds. READ AND FOLLOW 2,4-D PRODUCT LABELING FOR PRECAUTIONARY STATEMENTS, DIRECTIONS FOR USE, APPLICATION RATES AND TIMINGS, AND OTHER RESTRICTIONS.

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RON K. GRAPHIC SERVICES, LTD.

SC 110 — File No. 29

1-19-87 cm Hel Reg -1; Hel Bold-2; (114)

Job No. 0358 Sandoz Banvel Booklet

alley 33

TURF AND LAWNS

Including Golf Course Fairways, Aprons, Tees and Rough.

IMPORTANT

OBSERVE ALL PRECAUTIONS ON PAGES 4-5.
READ AND FOLLOW MIXING AND
APPLICATION INSTRUCTIONS ON PAGES 7-8.

To avoid injury to newly seeded grasses, application of BANVEL Herbicide should be delayed until after the second mowing. Furthermore, application rates in excess of 1 pint (1/2 lb. a.i.) per treated acre may cause noticeable stunting or discoloration of sensitive grass species such as bentgrass, carpetgrass, buffalograss, and St. Augustine grass.

In areas where roots of sensitive plants extend, do not apply in excess of 1/4 pint (1/8 lb. a.i.) of BANVEL Herbicide per treated acre on coarse textured (sandy-type) soils, or in excess of 1/2 pint (1/4 lb. a.i.) per treated acre on line textured (clayey-type) soils. Do not make repeat applications in these areas for 30 days and until previous applications of BANVEL Herbicide have been activated in the soil by rain or irrigation.

WEEDS CONTROLLED

BANVEL Herbicide, when applied at recommended rates, will give control of many ANNUAL, BIENNIAL, and noted (*) PERENNIAL broadleaf weeds commonly found in turf. BANVEL Herbicide will also give growth suppression of many other listed PERENNIAL broadleaf weeds and WOODY brush and vine species. (Refer to GENERAL WEED LIST on pages 9-13.)

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MIXING AND APPLICATION

Apply 30 to 200 gallons of diluted spray per treated acre (3 qts. to 4 1/4 gals. per 1,000 sq. ft.), depending on density or height of weeds treated and on the type of equipment used.

RATES AND TIMINGS

Use the higher level of listed rate ranges when treating dense vegetative growth.

WEED STAGE & TYPE	BANVEL Herbicide		
	pints per treated acre	lbs. a.i. per treated acre	teaspoons per 1000 sq. ft.
Annual Small, actively growing Established weed growth	1/2-1 1-1 1/2	1/4-1/2 1/2-3/4	1-2 1/4 2 1/4-3 1/4
Biennial Rosette diameter Less than 3 inches 3 inches or more	1/2-1 1-2	1/4-1/2 1/2-1	1-2 1/4 2 1/4-4 1/2
Perennials and Woody Brush and Vines	1-2	1/2-1	2 1/4-4 1/2

For best performance, apply when weeds are emerged and actively growing. Retreatments may be made as needed, however, do not exceed a total of 2 pints (1 lb. a.i.) BANVEL Herbicide per treated acre during a growing season.

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RON K. GRAPHIC SERVICES, LTD.

DISC 110 — File No. 31

03-19-87 cm Hel Reg -1; Hel Bold-2; (114)

Job No. 0358 Sandoz Banvel Booklet

alley 35

RON K. GRAPHIC SERVICES, LTD.

TANK MIX TREATMENTS

READ AND FOLLOW THE LABEL OF EACH TANK MIX PRODUCT USED FOR PRECAUTIONARY STATEMENTS, DIRECTIONS FOR USE, APPLICATION RATES AND TIMINGS AND OTHER RESTRICTIONS.

Tank mix treatments of BANVEL Herbicide may be made with 2,4-D, MCPA, MCPP, or bromoxynil for control of additional weeds listed on the tank mix product label.

Apply $\frac{1}{2}$ to $\frac{1}{2}$ pint ($\frac{1}{4}$ or $\frac{1}{4}$ lb. a.i.) of BANVEL Herbicide per treated acre with $\frac{1}{2}$ to $1\frac{1}{2}$ lbs. acid equivalent of 2,4-D, MCPA, or MCPP, or with $\frac{3}{4}$ to $\frac{1}{2}$ lb. a.i. of bromoxynil. Use the higher level of the listed rate ranges when treating established weeds. Repeat treatments may be made as needed; however, do not exceed 2 pints (1 lb. a.i.) of BANVEL Herbicide per treated acre during the growing season.

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GRASS SEED CROPS

Perennial Grasses such as Bermuda grass, Bluegrass, Lawntype Fescue and Ryegrass

IMPORTANT

OBSERVE ALL PRECAUTIONS ON PAGES 4-5.

READ AND FOLLOW MIXING AND

APPLICATION INSTRUCTIONS ON PAGES 7-8.

Refer to the PASTURE, RANGELAND, AND NON-CROPLAND IMPORTANT section (pages 38-39) for possible grazing and feeding restrictions.

Do not use on bentgrass unless possible crop injury can be tolerated.

RATES AND TIMINGS

Apply $\frac{1}{2}$ to 2 pints ($\frac{1}{4}$ to 1 lb. a.i.) of BANVEL Herbicide in 5 to 40 gallons of diluted spray per treated acre after weeds have emerged and are actively growing for control of broadleaf weeds such as:

alfalfa	chickweed, mouseear	knotweed
*bindweed, field	clover	sortel, red (sheep sorrel)
*catchfly, nightflowering	cockle, white	starwort, little
chamomile, corn	dock, curly	*thistle, Canada
chickweed, common	*knapweed, Russian	

*Top growth control only.

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ION K. GRAPHIC SERVICES, LTD.

ISC 110 — File No. 33

3-19-87 cm Hel. Reg -1; Hel. Bold-2; (114)

Job No. 0358 Sandoz Banvel Booklet

alley 37

Use $\frac{1}{2}$ to 1 pint ($\frac{1}{4}$ to $\frac{1}{2}$ lb. a.i.) of BANVEL Herbicide per treated acre on SEED-LING GRASS after the crop reaches the 3-5 leaf stage. Up to 2 pints (1 lb. a.i.) of BANVEL Herbicide per treated acre may be used on well established PERENNIAL GRASS. DO NOT APPLY AFTER THE GRASS SEED CROP BEGINS TO JOINT.

For control of ANNUAL GRASS WEEDS such as:

brome, downy (cheatgrass)
brome, ripgut
fescue, rattail

Apply 2 to 4 quarts (2-4 lbs. a.i.) of BANVEL Herbicide per treated acre in the fall or late summer after harvest and burning of established grass seed crops. Applications should be made within 3-14 days following first irrigation and before weeds have more than 2 leaves.

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BETWEEN CROPPING APPLICATIONS (BCA) FOR BROADLEAF WEED CONTROL

IMPORTANT

OBSERVE ALL PRECAUTIONS ON PAGES 4-5.

READ AND FOLLOW MIXING AND

APPLICATION INSTRUCTIONS ON PAGES 7-8.

WEEDS CONTROLLED

BANVEL Herbicide, when applied at the recommended rates, will control many ANNUAL and BIENNIAL broadleaf weeds. (Refer to GENERAL WEED LIST on pages 9-13). In addition, BANVEL Herbicide will control the following PERENNIAL broadleaf weeds:

*alfalfa	*dandelion, common	redvine
artichoke, Jerusalem	*dock, curly	smartweed, swamp
bindweed, field	dogbane, hemp	*sowthistle, perennial
bindweed, hedge	garlic, wild**	thistle, Canada**
blueweed, Texas	horsenettle, Carolina	trumpet creeper
*bursage	nightshade, silverleaf	(buckvine)
(bur ragweed)		
(povertyweed)		
(sawtooth)		

Noted(*) perennials may be controlled using BANVEL Herbicide at rates lower than those recommended for other listed perennial weeds (See RATES AND TIMINGS, pages 62-63.)

**SPECIAL TANK MIX TREATMENTS, pages 64-65, for specific control program

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ION K. GRAPHIC SERVICES, LTD.

ISC 110 — File No. 34

05-07-87 kk Hel. Reg -1; Hel. Bold 2; (114)

Job No. 0672 Sandoz Banvel Booklet

Galley 33

RATES AND TIMINGS

Apply BANVEL Herbicide as a broadcast or spot treatment to emerged and actively growing weeds after crop harvest and before a killing frost. Agriculturally approved spray additives, such as surfactants or oils, may be used to enhance spray coverage and the herbicide's penetration of weed foliage. See ROTATIONAL CROPS for recommended interval between application and planting to prevent crop injury.

For best performance, make application when ANNUAL weeds are less than 6 inches tall, when BIENNIAL weeds are in the rosette stage, and to PERENNIAL weed regrowth in late summer or fall following a mowing or tillage treatment. Most effective control of upright perennial broadleaf weeds, such as Canada thistle and Jerusalem artichoke, occurs if application is made when the majority of weeds is 8 inches or taller. Viney perennial broadleaf weeds, such as field bindweed and hedge bindweed, are best controlled when weeds are in or beyond the full bloom stage.

Avoid disturbing treated areas for at least 7 days following application. Treatments may not kill weeds which develop from seed or underground plant parts, such as rhizomes or bulbels, after the effective period for BANVEL Herbicide. For seedling control, a follow-up program or other cultural practices could be instituted (refer to pages 14-21, 22-24, 25-31, for corn, sorghum and wheat in-crop uses of BANVEL Herbicide).

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WEED STAGE & TYPE	BANVEL Herbicide per treated acre	
	amount	(lb. a.i.)
Annual	1/2-1 pt.	1/4-1/2
Biennial	1-2 pls.	1/2-1
Perennial		
Perennial suppression	1-2 pls.	1/2-1
Holed (*) perennials	2-4 pls.	1-2
Other perennials	4 pls.	2

Retreatments may be made as needed; however, do not exceed a total of 4 pints (2 lbs. a.i.) of BANVEL Herbicide per treated acre during any given fallow period.

TANK MIX TREATMENTS

BANVEL Herbicide may be tank mixed with one or more of the following herbicides for control of grasses or additional broadleaf weeds. Read and follow the label of each tank mix product used for precautionary statements, directions for use, rates and timings, weeds controlled and geographic or other restrictions.

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Rate per treated acre
(lb. a.i.)

Herbicide	
ANNUAL WEED CONTROL	
atrazine	1/2 to 3
chlorsulfuron* (Glean®)	0.016 to 0.024 (1/2-1/2 wt. oz. product)
cyanazine (Bladex®)	1 3/4 to 3 1/2
glyphosate (Roundup®)	1/4 to 1/2
metribuzin (Sencor®; Lexone®)	1/2 to 1
paraquat	1/4 to 1/2
2,4-D	
PERENNIAL WEED CONTROL	
glyphosate	1 to 2
2,4-D	1 to 2

*When making tank mix applications with Glean, add a surfactant of at least 80% active ingredient at the rate of 1-2 quarts/100 gallons of spray or not more than 1/4-1/2% by volume. Use the highest rate of surfactant when using the lower rate ranges of the tank mix and/or when treating more mature weeds or dense vegetative growth.

SPECIAL TANK MIX TREATMENTS

For suppression of perennial weeds, apply 0.25-0.50 lb. a.i. BANVEL Herbicide with 0.25-0.50 lb. a.i. Roundup Herbicide per treated acre.

For wild garlic control, apply 1 pint (1/2 lb. a.i.) BANVEL Herbicide with 1 1/2 lbs. acid equivalent 2,4-D low volatile ester per treated acre. Apply when wild garlic is 4 to 8 inches tall.

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For Canada thistle control, use BANVEL Herbicide or BANVEL plus Roundup Herbicide tank mix treatments.

Application may be made during fallow periods for control of volunteer barley, bulbous bluegrass, downy brome, jointed goatgrass, common rye and volunteer wheat when they are actively growing. Use 1 pint BANVEL Herbicide with 1/2-3/4 lb. Kerb 50W (0.25-0.38 lb. a.i.). Fall seeded wheat may be planted 9 months or more after application. For best performance, make application between mid-October and mid-December, prior to soil freeze up.

During fallow periods, apply BANVEL Herbicide plus Landmaster Herbicide to give improved control of kochia, wild buckwheat, prickly lettuce, field bindweed and Canada thistle. Use 4-8 fluid ounces of BANVEL Herbicide plus 40-54 fluid ounces of Landmaster Herbicide for annual weed control or 8-16 fluid ounces of BANVEL Herbicide plus 40-54 fluid ounces of Landmaster Herbicide for perennial weed suppression.

ROTATIONAL CROPS

The following recommendations are based on BANVEL Herbicide use rates up to 4 pints (2 lbs. a.i.) per treated acre.

CORN and SORGHUM may be planted in the spring following applications made during the previous year.

SOYBEANS may be planted in the spring following applications made during the previous year. If less than 1 inch of rainfall occurs between application and first killing frost, treated areas should be cultivated to allow herbicide to come in contact with moist soil. Cultivation may take place before or immediately after ground thaw.

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Soybean injury may occur if the interval between application and planting is less than specified. In areas with greater than 30 inches of rainfall, delay planting for 30 days per pint of BANVEL Herbicide per treated acre. In areas with less than 30 inches of rainfall, delay planting for 45 days per pint of BANVEL Herbicide per treated acre. Exclude days when ground is frozen.

WHEAT may be planted in the fall or spring following applications. Also, spot applications may be made any time prior to crop emergence if crop injury can be tolerated in treated areas. Wheat injury may occur if the interval between application and planting is less than specified.

East of the Mississippi River, the interval is 20 days per pint of BANVEL Herbicide per treated acre. Exclude days when ground is frozen.

West of the Mississippi River, the interval is 20 days per pint of BANVEL Herbicide per treated acre. Exclude days when ground is frozen.

Following a normal harvest of corn, sorghum, soybeans, or wheat, any rotational crop may be planted. If the interval before harvest is shortened, such as when cover crops will be plowed under, do not follow up with the planting of a sensitive crop.

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CONTROL OF PERENNIAL BROADLEAF WEEDS IN CROPLAND (SPOT APPLICATION ONLY)

For Use Only in the States of Idaho, Montana,
Nevada, Oregon, Utah, and Washington.

IMPORTANT

OBSERVE ALL PRECAUTIONS ON PAGES 4-5.
READ AND FOLLOW MIXING AND
APPLICATION INSTRUCTIONS ON PAGES 7-8.

Do not treat subirrigated cropland or areas where the soil remains saturated with water throughout the year.

Make only one application of BANVEL Herbicide per year.

WEEDS CONTROLLED

BANVEL Herbicide, when applied at recommended rates, will control many broadleaf weeds including:

bindweed, field	dock, curly	ragwort, lanky
dock, broadleaf	knapweed, black	spurge, leafy
(bitterdock)	knapweed, Russian	thistle, Canada

RATES AND TIMINGS

BANVEL Herbicide may be applied at any time following a crop harvest to stubble fallow or other cropland. Application should be made when weeds are actively growing and prior to a killing frost.

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Apply 4 to 6 quarts (4-6 lbs a l) of BANVEL Herbicide per treated acre. Application may be made up to one month prior to the planting of wheat. NOTE: Do not use unless injury to wheat or related barley will be acceptable.

Barley, oats, corn, sorghum (milo), annual or perennial grass crops may be planted into treated areas one year after application. Crops grown for seed (other than perennial grass seed) should not be planted into treated areas until three years after application. Do not plant broadleaf crops such as alfalfa, beans, peas, potatoes, or sugarbeets into treated areas until two years after application.

In most cases, treatments will not kill perennial weed seedlings which germinate from seed one or two years after treatment. Once the effect of the chemical has been lost, a follow-up program for seedling control or other cultural practices should be instituted.

WIPER APPLICATION USES IMPORTANT

OBSERVE ALL PRECAUTIONS ON PAGES 4-5.

BANVEL Herbicide may be applied through wiper application equipment to control or suppress actively growing broadleaf weeds, brush and vines. Use a solution containing 1 part BANVEL Herbicide to 1 part water. Do not contact desirable vegetation with herbicide solution. Wiper application should only be made to crops (including pastures) and non-cropland areas described in this label with the exception of Grain Sorghum (Milo).

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REGISTERED TRADEMARKS

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Banvel® Herbicide and Marksman® Herbicide are registered trademarks of Sandoz Ltd.

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24 (c) SPECIAL LOCAL NEED LABELING

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RON K. GRAPHIC SERVICES, LTD.
DISC 131 — File No. 07
04-21-87 kk Hel. Reg.-1; Hel. Bold-2; (114)
Job No. 0358 Sandoz Banvel Booklet
Galley 6

24 (c) SPECIAL LOCAL NEED LABELING SMALL GRAINS AERIAL APPLICATION

For Use Only in the States of
Colorado, Montana, Wyoming,
North Dakota and South Dakota

EPA SLN Nos.
CO-880006 ND-870009
MT-790004 SD-870001
WY-870002

Refer to the SMALL GRAINS section of this label (pages 25-34) for
DIRECTIONS FOR USE information.

BANVEL Herbicide may be applied using 1-5 gallons of diluted spray per treated
acre when using aerial application equipment in the above listed states only.

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24(c) SPECIAL LOCAL NEED LABELING WILD BUCKWHEAT CONTROL IN FALL SEEDED WHEAT

For Use Only Within the State of Oklahoma
EPA SLN No. OK-810004

IMPORTANT

OBSERVE ALL RESTRICTIONS AND PRECAUTIONS
AND APPLICATION DIRECTIONS ON PAGES 4-9

TIMING OF APPLICATION: Application of BANVEL Herbicide tank mixtures
given below can be made on wheat up to the development of a second node. Ap-
ply this mixture after the wild buckwheat has emerged and is actively growing.
For good control apply before wild buckwheat plants are larger than two true
leaves. Spray before a crop canopy is formed which would protect the weeds
from the spray.

TANK MIX TREATMENTS: Tank mix 1/4 pound active (1/4 pint) of BANVEL Her-
bicide with 1/4 pound active Bromoxynil plus 1/4 pound active MCPA or with 3/4
pound active Bromoxynil per treated acre. Bromoxynil plus MCPA is sold as Bro-
nata® (trademark of Rhone-Poulenc, Inc.) or Brominal® Plus (trademark of
Union Carbide Corp.). Bromoxynil is available as Brominal® (trademark of Union
Carbide Corp.) or Bucril® (trademark of Rhone-Poulenc, Inc.). Read and follow
all applicable directions, restrictions, and precautions on the Bromoxynil and
MCPA labels.

Dilute with water a minimum of 3 gallons total spray per acre for aerial applica-
tion and a minimum of 10 gallons total spray for ground application.

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24(c) SPECIAL LOCAL NEED LABELING ANNUAL WEED CONTROL IN MILLET

For Use Only
within the State of Nebraska
EPA SLN No. NE-830009

IMPORTANT
OBSERVE ALL PRECAUTIONS ON PAGES 4-5.

WEEDS CONTROLLED

ANNUALS

buckwheat, tartary	mallow, common	ragweed, common
buckwheat, wild	mayweed	ragweed, giant
carpetweed	mustard, annuals	(buffalo-weed)
chamomile, corn	mustard, tansy	salsify (goatsbeard)
chickweed, common	nightshade, black	sharpspurse
cockle, corn	pennycress, field	smartweed, green
cockle, cow	(lanweed,	smartweed
cocklebur, common	lrenchweed,	Pennsylvania
dragonhead, American	slinkweed)	sowthistle, annual
hemipetite	ploweed, redroot	starthistle, yellow
knawel (German Moss)	(carelessweed)	sunflower, common
knotweed	ploweed, rough	(wild)
kochia	ploweed, tumble	sunflower, volunteer
ladythumb	pineappleweed	thisle, Russian
lambsquarters,	puncturevine	velvetleaf
common	purslane, common	velch
lettuce, prickly	radish, wild	

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APPLICATION DIRECTIONS

Apply BANVEL Herbicide as a broadcast or spot treatment to emerged and ac-
tively growing weeds and when millet is in the 2 to 5 leaf stage.

For control of listed Annual broadleaf weeds, apply 1/4 pint BANVEL Herbicide
(1/4 lb. a.i.) with 3/4 a.i. 2,4-D.

5 to 50 gallons of diluted spray per treated acre may be applied when using
ground application equipment, or 3 to 10 gallons of diluted spray per treated acre
when using aerial application equipment.

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**24(c) SPECIAL LOCAL NEED LABELING
FOR CONTROL OF ANNUAL AND PERENNIAL BROADLEAF
WEEDS SUCH AS FIELD BINDWEED IN BETWEEN CROPPING
APPLICATIONS TO WHEAT**

For Use Only in the State of Oklahoma

EPA SLN No. OK-850008

IMPORTANT

OBSERVE ALL PRECAUTIONS ON PAGES 4-5.

Also read and follow the Tordon 22K federal label and 24-C label for precautionary statements, directions for use, geographic and other restrictions.

Observe the following requirements:

- Do not make application more than once each calendar year.
- Do not apply on or in the vicinity of susceptible crops or desirable plants including alfalfa, beans, grapes, melons, peas, potatoes, safflower, soybeans, sugar beets, sunflower, tomatoes and other vegetable crops, flowers, fruit plants, ornamentals, shade trees, or the soil containing roots of nearby valuable plants.
- Do not apply by air. For ground equipment do not apply with hollow cone-type insecticide or other nozzles that produce fine-droplet spray.
- Do not contaminate water intended for irrigation or domestic purposes. Do not treat or allow spray drift to fall onto innerbanks or bottom of irrigation ditches, either dry or containing water, or other channels that carry water that may be used for irrigation purposes.

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**24(c) SPECIAL LOCAL NEED LABELING
FOR CONTROL OF ANNUAL AND PERENNIAL BROADLEAF
WEEDS SUCH AS FIELD BINDWEED IN BETWEEN CROPPING
APPLICATIONS TO WHEAT**

For Use Only in the State of Texas

EPA SLN No. TX-860006

IMPORTANT

OBSERVE ALL PRECAUTIONS ON PAGES 4-5.

Also read and follow the Tordon 22K federal label and 24-C label for precautionary statements, directions for use, geographic and other restrictions.

Observe the following requirements:

- Do not make application more than once each calendar year.
- Do not apply on or in the vicinity of susceptible crops or desirable plants including alfalfa, beans, grapes, melons, peas, potatoes, safflower, soybeans, sugar beets, sunflower, tomatoes and other vegetable crops, flowers, fruit plants, ornamentals, shade trees, or the soil containing roots of nearby valuable plants.
- Do not apply by air. For ground equipment do not apply with hollow cone-type insecticide or other nozzles that produce fine-droplet spray.
- Do not contaminate water intended for irrigation or domestic purposes. Do not treat or allow spray drift to fall onto innerbanks or bottom of irrigation ditches, either dry or containing water or other channels that carry water that may be used for irrigation purposes.
- Do not move treated soil to other areas where susceptible desirable plants may be exposed and damaged while phytotoxic residues are present.

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- Avoid spray drift: Applications should be made only when there is no hazard from spray drift since very small quantities of the spray, which may not be visible, may severely injure susceptible crops during both growing and dormant periods.

RATES AND TIMINGS

Use BANVEL Herbicide plus Tordon 22K by ground application to control or reduce infestations of broadleaf annual and perennial weeds such as field bindweed on grainland during the period following crop harvest and prior to planting winter wheat. For reduction of perennial weeds such as field bindweed, broadcast treat infested areas using 0.5 to 1.0 pint of BANVEL Herbicide tank mixed with 0.5 to 1.0 pint of Tordon 22K in 10 or more gallons of water per acre. For best results, treat in June or July during a fallow period or following small grain harvest, applying the 1.0 pint plus 1.0 pint rate of BANVEL Herbicide and Tordon 22K. Initial treatment alternatively may be made during a fallow period after harvesting a fall maturing crop such as grain sorghum or corn. During the next calendar year, retreat the same area with BANVEL plus Tordon 22K, preferably in May or June in the fallow period prior to fall planting of the next wheat crop. An alternative application of BANVEL Herbicide without Tordon 22K may be made in the late summer or fall during the fallow period prior to fall wheat planting. For specific rates for the use of BANVEL Herbicide, see the BANVEL Herbicide Directions for Use booklet attached to the container. Avoid disturbing treated areas for at least 7 days following application. For seedling control a follow-up program or other cultural practices should be instituted.

Wheat may be injured when planted at varying periods following applications of Tordon 22K and BANVEL Herbicide. Do not use the BANVEL plus Tordon 22K tank mix if risk of injury to wheat cannot be tolerated.

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- Avoid spray drift: Applications should be made only when there is no hazard from spray drift since very small quantities of the spray, which may not be visible, may severely injure susceptible crops during both growing and dormant periods.
- Do not apply in the vicinity of sensitive crops when the temperature on the day of application is expected to exceed 85 degrees.

RATES AND TIMINGS

Use BANVEL Herbicide plus Tordon 22K by ground application to control or reduce infestations of broadleaf annual and perennial weeds such as field bindweed on grainland during the period following crop harvest and prior to planting winter wheat. For reduction of perennial weeds such as field bindweed, broadcast treat infested areas using 0.5 to 1.0 pint of BANVEL Herbicide tank mixed with 0.5 to 1.0 pint of Tordon 22K in 10 or more gallons of water per acre. For best results, treat in June or July during a fallow period or following small grain harvest, applying the 1.0 pint plus 1.0 pint rate of BANVEL Herbicide and Tordon 22K. Initial treatment alternatively may be made during a fallow period after harvesting a fall maturing crop such as grain sorghum or corn. During the next calendar year, retreat the same area with BANVEL plus Tordon 22K, preferably in May or June in the fallow period prior to fall planting of the next wheat crop. An alternative application of BANVEL Herbicide without Tordon 22K may be made in the late summer or fall during the fallow period prior to fall wheat planting. For specific rates for the use of BANVEL Herbicide, see the BANVEL Herbicide Directions for Use booklet attached to the container. Avoid disturbing treated areas for at least 7 days following application. For seedling control a follow-up program or other cultural practices should be instituted.

Wheat may be injured when planted at varying periods following applications of Tordon 22K and BANVEL Herbicide. Do not use the BANVEL plus Tordon 22K tank mix if risk of injury to wheat cannot be tolerated.

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This sample label is current as of April 1, 1989. The product descriptions and recommendations provided in this sample label are for background information only. Always refer to the label on the product container before using Monsanto or any other agrichemical product.

Roundup
Herbicide by Monsanto

Complete Directions

Reg. No. 524-308-AA

AVOID CONTACT WITH FOLIAGE, GREEN STEMS, OR FRUIT OF CROPS, DESIRABLE PLANTS AND TREES, SINCE SEVERE INJURY OR DESTRUCTION MAY RESULT.

This product has been approved for use in California except as stated otherwise on page 118.

1989-1

897.10-004.85/CG

Read the entire label before using this product.

Use only according to label instructions.

Read "LIMIT OF WARRANTY AND LIABILITY" before buying or using. If terms are not acceptable, return at once unopened.

LIMIT OF WARRANTY AND LIABILITY

(Not applicable to consumer applications applied by the homeowner for noncommercial purposes as permitted by the supplemental labeling for one-quart containers.)

This Company warrants that this product conforms to the chemical description on the label and is reasonably fit for the purposes set forth in the Complete Directions for Use label booklet ("Directions") when used in accordance with those Directions under the conditions described therein. NO OTHER EXPRESS WARRANTY OR IMPLIED WARRANTY OF FITNESS FOR PARTICULAR PURPOSE OR MERCHANTABILITY IS MADE. This warranty is also subject to the conditions and limitations stated herein.

Buyer and all users shall promptly notify this Company of any claims whether based in contract, negligence, strict liability, other tort or otherwise.

Buyer and all users are responsible for all loss or damage from use or handling which results from conditions beyond the control of this Company, including, but not limited to, incompatibility with products other than those set forth in the Directions, application to or contact with desirable vegetation, unusual weather, weather conditions which are outside the range considered normal at the application site and for the time period when the product is applied, as well as weather conditions which are outside the application ranges set forth in the Directions, application in any manner not explicitly set forth in the Directions, moisture conditions outside the moisture range specified in the Directions, or the presence of products other than those set forth in the Directions in or on the soil, crop or treated vegetation.

THE EXCLUSIVE REMEDY OF THE USER OR BUYER, AND THE LIMIT OF THE LIABILITY OF THIS COMPANY OR ANY OTHER SELLER FOR ANY AND ALL LOSSES, INJURIES OR DAMAGES RESULTING FROM THE USE OR HANDLING OF THIS PRODUCT (INCLUDING CLAIMS BASED IN

CONTRACT, NEGLIGENCE, STRICT LIABILITY, OTHER TORT OR OTHERWISE) SHALL BE THE PURCHASE PRICE PAID BY THE USER OR BUYER FOR THE QUANTITY OF THIS PRODUCT INVOLVED, OR, AT THE ELECTION OF THIS COMPANY OR ANY OTHER SELLER, THE REPLACEMENT OF SUCH QUANTITY OR, IF NOT ACQUIRED BY PURCHASE, REPLACEMENT OF SUCH QUANTITY. IN NO EVENT SHALL THIS COMPANY OR ANY OTHER SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES.

Buyer and all users are deemed to have accepted the terms of this LIMIT OF WARRANTY AND LIABILITY which may not be varied by any verbal or written agreement.

PRECAUTIONARY STATEMENTS

Hazards to Humans and Domestic Animals

Keep out of reach of children.

WARNING!

CAUSES EYE IRRITATION.
HARMFUL IF SWALLOWED.
MAY CAUSE SKIN IRRITATION.

Do not get in eyes, on skin or on clothing.

Wash thoroughly after handling.

FIRST AID: IF IN EYES, immediately flush with plenty of water for at least 15 minutes. Call a physician.

IF ON SKIN, immediately flush with plenty of water. Remove contaminated clothing. Wash clothing before reuse.

IF SWALLOWED, this product will cause gastrointestinal tract irritation. Immediately dilute by swallowing water or milk. Call a physician.

In case of an emergency involving this product, Call Collect, day or night, (314) 694-4000.

Environmental Hazards

Do not apply directly to water or wetland (swamps, bogs, marshes or potholes.) Do not contaminate water by cleaning of equipment or disposal of wastes.

Physical or Chemical Hazards

Spray solutions of this product should be mixed, stored and applied only in stainless steel, aluminum, fiberglass, plastic and plastic-lined steel containers.

DO NOT MIX, STORE OR APPLY THIS PRODUCT OR SPRAY SOLUTIONS OF THIS PRODUCT IN GALVANIZED STEEL OR UNLINED STEEL (EXCEPT STAINLESS STEEL) CONTAINERS OR SPRAY TANKS. This product or spray solutions of this product react with such containers and tanks to produce hydrogen gas which may form a highly combustible gas mixture. This gas mixture could flash or explode, causing serious personal injury, if ignited by open flame, spark, welder's torch, lighted cigarette or other ignition source.

ACTIVE INGREDIENT.

*Isopropylamine salt of
glyphosate

INERT INGREDIENTS.

41.0%

59.0%

100.0%

*Contains 480 grams per litre or 4 pounds of the active ingredient isopropylamine salt of N-(phosphonomethyl) glycine per U.S. gallon. Equivalent to 356 grams per litre or 3 pounds per U.S. gallon of the acid, glyphosate.

Product protected by
U.S. Pat. No. 3,799,758 and
U.S. Pat. No. 4,405,531
Other patents pending

No license granted under any, non-U.S. patent

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In case of an emergency involving this product, Call Collect, day or night, (314) 694-4000

MONSANTO COMPANY
AGRICULTURAL PRODUCTS
ST. LOUIS, MISSOURI, 63167 U.S.A.



GENERAL INFORMATION

DO NOT APPLY THIS PRODUCT USING AERIAL SPRAY EQUIPMENT EXCEPT UNDER CONDITIONS AS SPECIFIED WITHIN THIS LABEL.

Roundup® herbicide, a water soluble liquid, mixes readily with water to be applied as a foliar spray for the control or destruction of most herbaceous plants. It may be applied through most standard industrial or field-type sprayers after dilution and thorough mixing with water in accordance with label instructions.

This product moves through the plant from the point of foliage contact to and into the root system. Visible effects on most annual weeds occur within 2 to 4 days, but on most perennial weeds may not occur for 7 days or more. Extremely cool or cloudy weather following treatment may slow down activity of this product and delay visual effects of control. Visible effects are a gradual wilting and yellowing of the plant which advances to complete browning of above ground growth and deterioration of underground plant parts.

Unless otherwise specified on this label, delay application until vegetation has emerged and reached the stages described for control of such vegetation under the "Weeds Controlled" section of this label. Unemerged plants arising from unattached underground rhizomes or root stocks of perennials will not be affected by the spray and will continue to grow. For this reason, best control of most perennial weeds is obtained when treatment is made at late growth stages approaching maturity.

Always use the higher rate of this product per acre within the recommended range when (1) weed growth is heavy or dense, or (2) weeds are growing in an undisturbed (noncultivated) area.

Do not treat weeds under poor growing conditions such as drought stress, disease or insect damage, as reduced weed control may result. Reduced results may also occur when treating weeds heavily covered with dust.

Reduced control may result when applications are made to annual or perennial weeds that have been mowed, grazed, or cut, and have not been allowed to regrow to the recommended stage for treatment.

Rainfall or irrigation occurring within 6 hours after application may reduce effectiveness. Heavy rainfall or irrigation within 2 hours after application may wash the

chemical off the foliage and a repeat treatment may be required.

Roundup herbicide does not provide residual weed control. For subsequent residual weed control, follow a label-approved herbicide program. Read and carefully observe the cautionary statements and all other information appearing on the labels of all herbicides used.

Buyer and all users are responsible for all loss or damage in connection with the use or handling of mixtures of Roundup with herbicides or other materials that are not expressly recommended in this labeling. Mixing this product with herbicides or other materials not recommended on this label may result in reduced performance.

For best results, spray coverage should be uniform and complete. Do not spray weed foliage to the point of runoff.

Keep people and pets off treated areas until spray solution has dried.

DOMESTIC ANIMALS: This product is considered to be relatively nontoxic to dogs and other domestic animals. However, ingestion of this product or large amounts of freshly sprayed vegetation may result in temporary gastrointestinal irritation (vomiting, diarrhea, colic, etc.). If such symptoms are observed, provide the animal with plenty of fluids to prevent dehydration. Call a veterinarian if symptoms persist for more than 24 hours.

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ATTENTION

AVOID DRIFT. EXTREME CARE MUST BE USED WHEN APPLYING THIS PRODUCT TO PREVENT INJURY TO DESIRABLE PLANTS AND CROPS.

Do not allow the herbicide solution to mist, drip, drift, or splash onto desirable vegetation since minute quantities of this herbicide can cause severe damage or destruction to the crop, plants, or other areas on which treatment was not intended. The likelihood of injury occurring from the use of this product is greatest when winds are gusty or in excess of 5 miles per hour or when other conditions, including lesser wind velocities, will allow spray drift to occur. When spraying, avoid combinations of pressure and nozzle type that will result in splatter or fine particles (mist) which are likely to drift. **AVOID APPLYING AT EXCESSIVE SPEED OR PRESSURE.**

NOTE: Use of this product in any manner not consistent with this label may result in injury to persons, animals or crops, or other unintended consequences. Keep container closed to prevent spills and contamination.

MIXING, ADDITIVES AND APPLICATION INSTRUCTIONS

APPLY THESE SPRAY SOLUTIONS IN PROPERLY MAINTAINED AND CALIBRATED EQUIPMENT CAPABLE OF DELIVERING DESIRED VOLUMES. DO NOT APPLY UNDER WIND OR OTHER CONDITIONS WHICH ALLOW DRIFT TO OCCUR. HAND GUN APPLICATIONS SHOULD BE PROPERLY DIRECTED TO AVOID SPRAYING DESIRABLE PLANTS. **NOTE:** REDUCED RESULTS MAY OCCUR IF WATER CONTAINING SOIL IS USED, such as WATER FROM PONDS AND UNLINED DITCHES.

MIXING

This product mixes readily with water. Mix spray solutions of this product as follows. Fill the mixing or spray tank with the required amount of water. Add the proper

amount of this product (see "Directions for Use" and "Weeds Controlled" sections of this label) near the end of the filling process and mix well. Remove hose from tank immediately after filling to avoid siphoning back into the carrier source. During mixing and application foaming of the spray solution may occur. To prevent or minimize foam, avoid the use of mechanical agitators, place the filling hose below the surface of the spray solution, terminate by-pass and return lines at the bottom of the tank and if needed use an approved anti-foam or defoaming agent.

TANK MIXTURES

Always predetermine the compatibility of labeled tank mixtures of this herbicide with water carrier by mixing small proportional quantities in advance.

Mix labeled tank mixtures of Roundup herbicide with water as follows:

1. Place a 20 to 35 mesh screen or wetting basket over filling port.
2. Through the screen, fill the sprayer tank one-half full with water and start agitation.
3. If a wettable powder is used, make a slurry with the water carrier, and add it SLOWLY through the screen into the tank. Continue agitation.
4. If a flowable formulation is used, pre-mix one part flowable with one part water. Add diluted mixture SLOWLY through the screen into the tank. Continue agitation.
5. If an emulsifiable concentrate formulation is used, pre-mix one part emulsifiable concentrate with two parts water. Add diluted mixture slowly through the screen into the tank. Continue agitation.
6. Continue filling the sprayer tank with water and add the required amount of Roundup herbicide near the end of the filling.
7. Where nonionic surfactant is recommended, add this to the spray tank before completing the filling process.
8. Add individual formulations to the spray tank as follows: wettable powder, flowable, emulsifiable concentrate, drift control additive, water soluble liquid followed by surfactant.

Maintain good agitation at all times until the contents of the tank are sprayed. If the spray mixture is allowed to settle, thorough agitation is required to resuspend the mixture before spraying is resumed.

Keep by-pass line on or near bottom of tank to minimize foaming. Screen size in nozzle or line strainers should be no finer than 50 mesh. Carefully select proper nozzle to avoid spraying a fine mist. For best results with conventional ground application equipment, use flat fan nozzles.

Clean sprayer and parts immediately after using this product by thoroughly flushing with water.

ADDITIVES

SURFACTANTS

Nonionic surfactants which are labeled for use with herbicides may be used. Do not reduce rates of this herbicide when adding surfactant. When adding additional surfactant or label instructions require the use of additional surfactant, use 0.5 percent surfactant concentration (2 quarts per 100 gallons of spray solution) when using surfactants which contain at least 50 percent ac-

tive ingredient or a 1 percent surfactant concentration (4 quarts per 100 gallons of spray solution) for those surfactants containing less than 50 percent active ingredient. Read and carefully observe surfactant cautionary statements and other information appearing on the surfactant label.

AMMONIUM SULFATE

The addition of 2 percent dry ammonium sulfate by weight or 17 pounds per 100 gallons of water may increase the performance of Roundup and Roundup plus 2,4-D amine or Banvel™ tank mixtures on annual and perennial weeds. The improvement in performance may be apparent where environmental stress is a concern. Low-quality ammonium sulfate may contain material that will not readily dissolve which could result in nozzle tip plugging. To determine quality, perform a jar test by adding ½ cup of ammonium sulfate to 1 gallon of water and agitate for 1 minute. If undissolved sediment is observed, predissolve the ammonium sulfate in water and filter prior to addition to the spray tank. If ammonium sulfate is added directly to the spray tank, add slowly with agitation. Adding too quickly may clog outlet lines. Ensure that ammonium sulfate is completely dissolved in the spray tank before adding herbicides or surfactant. Thoroughly rinse the spray system with clean water after use to reduce corrosion.

NOTE: The use of ammonium sulfate as an additive does not preclude the need for additional surfactant. Do not use herbicide rates lower than recommended in this label.

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COLORANTS OR DYES

Agriculturally approved colorants or marking dyes may be added to this product. Colorants or dyes used in spray solutions of this product may reduce performance, especially at lower rates or dilutions. Use colorants or dyes according to the manufacturer's recommendations.

APPLICATION EQUIPMENT AND TECHNIQUES

Do not apply this product through any type of irrigation system.

This product may be applied with the following application equipment.

Aerial—Fixed Wing and Helicopter

Broadcast Spray

Controlled Droplet Applicator (CDA)—Hand-held or boom-mounted applicators which produce a spray consisting of a narrow range of droplet sizes.

Hand-Held and High-Volume Spray Equipment—Knapsack and backpack sprayers, pump-up pressure sprayers, handguns, handwands, lances and other hand-held spray equipment used to direct the spray onto weed foliage and vehicle mounted high-volume spray equipment for spray-to-wet applications.

Selective equipment—Recirculating sprayers, shielded sprayers and wiper applicators

See the appropriate part of this section for specific rates of application and instructions

AERIAL EQUIPMENT

Use the recommended rates of this herbicide in 3 to 15 gallons of water per acre unless otherwise specified on this label. See the "Weeds Controlled" section of this

label for specific rates. Unless otherwise specified, do not exceed the one-quart rate per acre of this product.

(Aerial applications of this product may be made in annual cropping conventional tillage systems, fallow and reduced tillage systems, preharvest, silvicultural sites, and rights-of-way. Refer to the individual use area sections of this label for recommended volumes and application rates.) FOR AERIAL APPLICATION IN CALIFORNIA, REFER TO THE FEDERAL SUPPLEMENTAL LABEL FOR AERIAL APPLICATIONS IN THAT STATE FOR SPECIFIC INSTRUCTIONS, RESTRICTIONS AND REQUIREMENTS.

Avoid direct application to any body of water.

AVOID DRIFT—DO NOT APPLY DURING INVERSION CONDITIONS, WHEN WINDS ARE GUSTY, OR UNDER ANY OTHER CONDITION WHICH WILL ALLOW DRIFT. DRIFT MAY CAUSE DAMAGE TO ANY VEGETATION CONTACTED TO WHICH TREATMENT IS NOT INTENDED. TO PREVENT INJURY TO ADJACENT DESIRABLE VEGETATION, APPROPRIATE BUFFER ZONES MUST BE MAINTAINED.

Coarse sprays are less likely to drift; therefore, do not use nozzles or nozzle configurations which dispense spray as fine spray droplets. Do not angle nozzles forward into the airstream and do not increase spray volume by increasing nozzle pressure.

Drift control additives may be used. When a drift control additive is used, read and carefully observe the cautionary statements and all other information appearing on the additive label.

Ensure uniform application—To avoid streaked, uneven or overlapped application, use appropriate marking devices.

Thoroughly wash aircraft, especially landing gear, after each day of spraying to remove residues of this product accumulated during spraying or from spills. **PROLONGED EXPOSURE OF THIS PRODUCT TO UNCOATED STEEL SURFACES MAY RESULT IN CORROSION AND POSSIBLE FAILURE OF THE PART. LANDING GEAR ARE MOST SUSCEPTIBLE.** The maintenance of an organic coating (paint) which meets aerospace specification MIL-C-38413 may prevent corrosion.

■ BROADCAST EQUIPMENT ■

For control of annual or perennial weeds listed on this label using broadcast equipment—Use the recommended rates of this product in 3 to 40 gallons of water per acre as a broadcast spray unless otherwise specified on this label. See the "Weeds Controlled" section of this label for specific rates. As density of weeds increases, spray gallonage should be increased within the recommended range to ensure complete coverage. Carefully select proper nozzle to avoid spraying a fine mist. For best results with ground application equipment, use flat fan nozzles. Check for even distribution of spray droplets.

■ CONTROLLED DROPLET APPLICATION (CDA) ■

The rate of this product applied per acre by vehicle-mounted CDA equipment must not be less than the amount recommended in this label when applied by conventional broadcast equipment. For vehicle-mounted CDA equipment apply 3 to 15 gallons of water per acre.

For the control of labeled annual weeds with hand-held CDA units, apply a 20 percent solution of this product at a flow rate of 2 fluid ounces per minute and a walking speed of 1.5 MPH (1 quart per acre). For the control of labeled perennial weeds, apply a 20 to 40 percent solution of this product at a flow rate of 2 fluid ounces

per minute and a walking speed of 0.75 MPH (2 to 4 quarts per acre)

Controlled droplet application equipment produces a spray pattern which is not easily visible. Extreme care must be exercised to avoid spray or drift contacting the foliage or any other green tissue of desirable vegetation as damage or destruction may result.

■ HAND-HELD and HIGH-VOLUME EQUIPMENT ■

Use coarse sprays only.

Mix this product in clean water and apply to foliage of vegetation to be controlled. For applications made on a spray-to-wet basis, spray coverage should be uniform and complete. Do not spray to the point of runoff.

For control of annual weeds listed on this label, apply a 0.5 percent solution of this product plus nonionic surfactant to weeds less than 6 inches in height or runner length. Apply prior to seedhead formation in grass or bud formation in broadleaves. Allow three or more days before tillage or mowing.

For annual weeds over 6 inches tall, or when not using additional surfactant, or unless otherwise specified, use a 1 percent solution. For best results, use a 2 percent solution on harder-to-control perennials, such as bermudagrass, dock, field bindweed, hemp dogbane, milkweed and Canada thistle.

Less than complete coverage of weeds may result from the use of spray equipment designed for motorized spot treatments. Where less than complete coverage of annual weeds occurs, use a 5 percent solution. Do not reduce recommended concentrations of Roundup when adding surfactant.

Prepare the desired volume of spray solution by mixing the amount of this product in water as shown in the following table:

Spray Solution

DESIRED VOLUME	AMOUNT OF ROUNDUP®				
	½%	1%	1½%	2%	5%
1 gallon	¾ oz	1½ oz	2 oz	2½ oz	6½ oz
25 gallons	1 pt	1 qt	1½ qt	2 qt	5 qt
100 gallons	2 qt	1 gal	1½ gal	2 gal	5 gal
2 tablespoons = 1 ounce					

For use in knapsack sprayers, it is suggested that the proper amount of this product be mixed with water in a larger container. Fill sprayer with the mixed solution.

For hand-held WIPER APPLICATORS see the "Selective Equipment" section and for hand-held CONTROLLED DROPLET APPLICATORS see the "Controlled Droplet Applicator (CDA)" section of this label.

■ SELECTIVE EQUIPMENT ■

This product may be applied through a recirculating spray system, a shielded applicator, or a wiper applicator after dilution and thorough mixing with water to listed weeds growing in any noncrop site specified on this label and only when specifically recommended in cropping systems.

A recirculating spray system directs the spray solution onto weeds growing above desirable vegetation, while spray solution not intercepted by weeds is collected and returned to the spray tank for reuse.

A shielded applicator directs the herbicide solution onto weeds while shielding desirable vegetation from the herbicide.

A wiper applicator applies the herbicide solution onto weeds by rubbing the weed with an absorbent material containing the herbicide solution.

AVOID CONTACT WITH DESIRABLE VEGETATION

Contact of the herbicide solution with the desirable vegetation may result in damage or destruction. Applicators used above desired vegetation should be adjusted so that the lowest spray stream or wiper contact point is at least two inches above the desirable vegetation. Droplets, mist, foam, or splatter of the herbicide solution settling on desirable vegetation may result in discoloration, stunting, or destruction.

Applications made above the crops should be made when the weeds are a minimum of 6 inches above the desirable vegetation. Better results may be obtained when more of the weed is exposed to the herbicide solution. Weeds not contacted by the herbicide solution will not be affected. This may occur in dense clumps, severe infestations, or when the height of the weeds varies so that not all weeds are contacted. In these instances, repeat treatment may be necessary.

See the "Weeds Controlled" section of this label for recommended stage of growth for specific weeds

NOTE

- Maintain equipment in good operating condition. Avoid leakage or dripping onto desirable vegetation.
- Adjust height of applicator to insure adequate contact with weeds.
- Keep nozzle tips and wiping surfaces clean.
- Keep spray patterns aligned into recovery chamber of the recirculating sprayer.
- Keep shields on shielded applicators adjusted to protect desirable vegetation.
- Maintain recommended roller RPM on roller applicators while in use.
- Keep wiper material at proper degree of saturation with herbicide solution.
- DO NOT use wiper equipment when weeds are wet.
- DO NOT operate equipment at ground speeds greater than 5 mph. Weed control may be affected by speed of application equipment. As weed density increases, reduce equipment ground speed to insure good coverage of weeds.
- Be aware that on sloping ground the herbicide solution may migrate, causing dripping on the lower end and drying on the upper end of a wiper applicator.
- Variation in equipment design may affect weed control. With wiper applicators, the wiping material and its orientation must allow delivery of sufficient quantities of the recommended herbicide solution directly to the weed.
- Care must be taken with all types of wipers to ensure that the absorbent material does not become oversaturated, causing the herbicide to drip on desirable vegetation.
- Mix only the amount of solution to be used during a one-day period, as reduced activity may result from use of leftover solutions. With all equipment, drain and clean sprayer and wiper parts immediately after using this product by thoroughly flushing with water.

RECIRCULATING SPRAYERS

Recirculating sprayer calibration is made on the basis of ground speed and delivery volume. Two procedures can be used to calibrate: (1) determine the discharge being

delivered per minute, then operate at the designated ground speed, or (2) select the desired ground speed and then adjust the sprayer to deliver the recommended volume per minute (this may require nozzle changes). Use the appropriate table below.

Do not operate at nozzle pressure above 20 PSI.

Table 1. Use this table when calibrating box or row-type recirculating sprayers. Box or row-type sprayer calibration is based on the total discharge collected per row.

Use only straight stream or 15° fan-type nozzles.

*VOLUME PER MINUTE PER ROW	
MPH	Ounces
2	26 to 35
3	38 to 51
4	51 to 68
5	65 to 86

*NOTE: Be certain the amount collected is for all spray streams treating one row.

Table 2. Use this table when calibrating broadcast type recirculating sprayers. Broadcast recirculating sprayer calibration is based on the discharge collected per minute from one nozzle on a 20-inch spacing.

VOLUME PER MINUTE PER NOZZLE	
MPH	Ounces
2	7 to 9
3	10 to 13
4	13 to 18
5	16 to 22

When applied as recommended under the conditions described for recirculating sprayers, this product will control the following weeds growing a minimum of 6 inches above desirable vegetation.

Perennial Broadleaf Weeds—To SUPPRESS the following weeds, mix in a ratio of 4 quarts of this product in 20 gallons of water and apply as directed.

Dogbane, hemp <i>Apocynum cannabinum</i>	Milkweed <i>Asclepias syriaca</i>
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Perennial Grasses and Annual Broadleaf Weeds—To control the following weeds, mix in a ratio of 3 quarts of this product in 20 gallons of water and apply as directed:

Cocklebur <i>Xanthium strumarium</i>	Pigweed, redroot <i>Amaranthus retroflexus</i>
Johnsongrass <i>Sorghum halepense</i>	Sunflower <i>Helianthus annuus</i>

Annual Grasses—To control the following weeds, mix in a ratio of 2 quarts of this product in 20 gallons of water and apply as directed:

Corn <i>Zea mays</i>	Shattercane <i>Sorghum bicolor</i>
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SHIELDED APPLICATORS

When applied as directed under conditions described for shielded applicators, this product will control those weeds listed in the "Weeds Controlled" section of this label.

Shielded applicators which apply the herbicide solution as a spray band should be calibrated on a broadcast equivalent rate and volume basis. To determine these

Band width in inches	×	Herbicide Broadcast RATE per acre	=	Herbicide Band RATE per acre
Row width in inches				
Band width in inches	×	Broadcast VOLUME of solution per acre	=	Band VOLUME of solution per acre
Row width in inches				

Use nozzles that provide uniform coverage within the treated area. EXTREME CARE MUST BE EXERCISED TO AVOID CONTACT WITH DESIRABLE VEGETATION.

For specific rates of application and instructions for control of various annual and perennial weeds, see the "Weeds Controlled" section of this label.

WIPER APPLICATORS

Wiper applicators include either roller or wick devices which physically wipe appropriate concentrations or amounts of this product directly onto the weed. Equipment must be designed, maintained, and operated to prevent the herbicide solution from contacting desirable vegetation. Operate this equipment at ground speeds no greater than 5 mph. Performance may be improved by reducing speed in areas of heavy weed infestations to ensure adequate wiper saturation. Better results may be obtained if two applications are made in opposite directions.

Do not add surfactant to the herbicide solution.

For Roller Applicators—Mix 1 gallon of this product in enough water to prepare 10 gallons of herbicide solution (10 percent solution). Apply this solution to perennial weeds or annual broadleaf weeds listed in this "Wiper Applicators" section.

Mix 1 gallon of this product in enough water to provide 20 gallons of herbicide solution (5 percent solution). Apply this solution to annual grasses listed in this "Wiper Applicators" section.

Roller speed should be maintained at 40 to 60 RPM.

For Wick or Wiper Applicators—Mix 1 gallon of this product in 2 gallons of water to prepare a 33 percent solution. Apply this solution to weeds listed in this "Wiper Applicators" section.

In severe infestations, reduce equipment ground speed to ensure that adequate amounts of this product are wiped on the weeds. A second treatment in the opposite direction may be beneficial.

Do not permit herbicide solution to contact desirable vegetation.

When applied as recommended under the conditions described for "Wiper Applicators", this product CONTROLS the following weeds:

ANNUAL GRASSES

Corn <i>Zea mays</i>	Rye, common <i>Secale cereale</i>
Panicum, Texas <i>Panicum texanum</i>	Shattercane <i>Sorghum bicolor</i>

ANNUAL BROADLEAVES

Sicklepod <i>Cassia obtusifolia</i>	Starbur, bristly <i>Acanthospermum hispidum</i>
Spanishneedles <i>Bidens bipinnata</i>	

When applied as recommended under the conditions described for "Wiper Applicators", this product SUPPRESSES the following weeds:

ANNUAL BROADLEAVES

Beggarweed, Florida <i>Desmodium tortuosum</i>	Ragweed, giant <i>Ambrosia trifida</i>
Dogfennel <i>Eupatorium capilliflorum</i>	Sunflower <i>Helianthus annuus</i>
Pigweed, redroot <i>Amaranthus retroflexus</i>	Thistle, musk <i>Carduus nutans</i>
	Velvetleaf <i>Abutilon theophrasti</i>

Ragweed, common
Ambrosia artemisiifolia

PERENNIAL GRASSES

Bermudagrass <i>Cynodon dactylon</i>	Smutgrass <i>Sporobolus poiretii</i>
Guineagrass <i>Panicum maximum</i>	Vaseygrass <i>Paspalum urvillei</i>
Johnsongrass <i>Sorghum halepense</i>	

PERENNIAL BROADLEAVES

Dogbane, hemp <i>Apocynum cannabinum</i>	Nightshade, silverleaf <i>Solanum elaeagnifolium</i>
Milkweed <i>Asclepias syriaca</i>	Thistle, Canada <i>Cirsium arvense</i>

WEEDS CONTROLLED

This herbicide controls many annual and perennial grasses and broadleaf weeds.

ANNUAL WEEDS

- Apply to actively growing grass and broadleaf weeds.
- Allow at least 3 days after treatment before tillage.
- For maximum agronomic benefit, apply when weeds are 6 inches or less in height.
- To prevent seed production, applications should be made prior to seedhead formation.
- This product does not provide residual control; therefore, delay application until maximum weed emergence. Repeat treatments may be necessary to control later germinating weeds.

LOW-VOLUME BROADCAST APPLICATION (LOW-RATE TECHNOLOGY)

When applied as directed under the conditions described, this product will control the weeds listed below when:

1. Water carrier volumes are 3 to 10 gallons per acre for ground applications and 3 to 5 gallons per acre for aerial applications. (See the "Aerial Application" section of this label for approved sites.)
2. A nonionic surfactant is added at 0.5 to 1 percent by total spray volume. Use 0.5 percent surfactant concentration when using surfactants which contain at least 50 percent active ingredient or a 1 percent surfactant concentration for those surfactants containing less than 50 percent active ingredient

NOTE

- The addition of 2 percent dry ammonium sulfate by weight or 17 pounds per 100 gallons of water may increase the performance of this herbicide on annual weeds. The improvement in performance may be apparent where environmental stress is a concern

Refer to the "Mixing, Additives and Application Instructions" section of this label

- Do not tank-mix with soil residual herbicides when using these rates unless otherwise specified
- For weeds that have been mowed, grazed, or cut, allow regrowth to occur prior to treatment.
- Refer to the "Tank Mixtures" portion of this section for control of additional broadleaf weeds.

WEED SPECIES	MAXIMUM HEIGHT	RATE PER ACRE**
Foxtail <i>Setaria spp.</i>	12"	8 oz.
Barnyardgrass <i>Echinochloa crus-galli</i>	6" (0 to 4" (4 to 6"	12 oz. 16 oz. ¹ 24 oz. ¹
Bluegrass, annual <i>Poa annua</i>		
Brome, downy* <i>Bromus tectorum</i>		
Mustard, blue <i>Chorispora tenella</i>		
Mustard, tansy <i>Descurainia pinnata</i>		
Mustard, tumble <i>Sisymbrium altissimum</i>		
Mustard, wild <i>Sinapis arvensis</i>		
Spurry, umbrella <i>Holosteum umbellatum</i>		
Barley <i>Hordeum vulgare</i>	12"	
Rye <i>Secale cereale</i>		
Sandbur, field <i>Cenchrus spp.</i>		
Shattercane <i>Sorghum bicolor</i>		
Stinkgrass <i>Eragrostis cilianensis</i>		
Wheat <i>Triticum aestivum</i>	18"	
Morningglory <i>Ipomea spp.</i>	2"	16 oz.
Sicklepod <i>Cassia obtusifolia</i>		
Bluegrass, bulbous <i>Poa bulbosa</i>	6"	
Cheat <i>Bromus secalinus</i>		
Chickweed, mouseear <i>Cerastium vulgatum</i>		
Corn <i>Zea mays</i>		
Groundsel, common <i>Senecio vulgaris</i>		
Horseweed/Marestail <i>Conyza canadensis</i>		

WEED SPECIES	MAXIMUM HEIGHT	RATE PER ACRE**
Lambsquarters, common <i>Chenopodium album</i>	6"	16 oz.
Pennycress, field <i>Thlaspi arvense</i>		
Rocket, London <i>Sisymbrium irio</i>		
Ryegrass, Italian <i>Lolium multiflorum</i>		
Shepherdspurse <i>Capsella bursa-pastoris</i>		
Buttercup <i>Ranunculus spp.</i>	12"	
Cocklebur <i>Xanthium strumarium</i>		
Crabgrass <i>Digitaria spp.</i>		
Dwarf dandelion <i>Krigia cespitosa</i>		
Falseflax, smallseed <i>Camelina microcarpa</i>		
Foxtail, Carolina <i>Alopecurus carolinianus</i>		
Johnsongrass, seedling <i>Sorghum halepense</i>		
Oats, wild <i>Avena fatua</i>		
Panicum, fall <i>Panicum dichotomiflorum</i>		
Panicum, Texas <i>Panicum texanum</i>		
Pigweed, redroot <i>Amaranthus retroflexus</i>		
Pigweed, smooth <i>Amaranthus hybridus</i>		
Witchgrass <i>Panicum capillare</i>		
Sicklepod <i>Cassia obtusifolia</i>	3 to 4"	24 oz.
Signalgrass, broadleaf <i>Brachiaria platyphylla</i>	4"	
Horseweed/Marestail <i>Conyza canadensis</i>	7 to 12"	
Lambsquarters, common <i>Chenopodium album</i>		
Teaweed <i>Sida spinosa</i>	4"	32 oz.
Rice, red <i>Oryza sativa</i>	6"	
Geranium, Carolina <i>Geranium carolinianum</i>	12"	
Goosegrass <i>Eleusine indica</i>		
Primrose, cutleaf evening <i>Oenothera laciniate</i>		

WEED SPECIES	MAXIMUM HEIGHT	RATE PER ACRE**
Pusley, Florida <i>Richardia scabra</i>	12"	32 oz.
Sicklepod <i>Cassia obtusifolia</i>	5 to 12"	
Spanishneedles <i>Bidens bipinnata</i>		
Filaree <i>Erodium spp.</i>	12"	48 oz.

¹Use these rates in Alabama, Arkansas, Mississippi, Missouri, Louisiana and Texas for preplant treatments.

*For control in no-till systems, use 16 fluid ounces per acre.

**For those rates less than 32 ounces per acre, Roundup at rates up to 32 ounces per acre may be used where heavy weed densities exist.

TANK MIXTURES

ROUNDUP® plus BANVEL
plus NONIONIC SURFACTANT

ROUNDUP plus 2,4-D AMINE
plus NONIONIC SURFACTANT

DO NOT APPLY BANVEL OR 2,4-D AMINE TANK MIXTURES BY AIR IN CALIFORNIA.

These tank mixtures are recommended for use in fallow and reduced tillage areas only. Follow use directions as given in the "Low-Volume Broadcast Application" section.

Roundup plus Banvel or 2,4-D amine will control the annual grasses and broadleaf weeds previously listed for Roundup alone at the indicated heights (except 8 ounces per acre applications), plus the following broadleaf weeds. For those weeds previously listed at 8 ounces of Roundup herbicide alone per acre, use the 12-ounce rate in these tank mixtures.

NOTE: Refer to the specific product labels for crop rotation restrictions and cautionary statements of all products used in tank mixtures. Some crop injury may occur if Banvel is applied within 45 days of planting. The addition of Banvel in a mixture with this product may provide short-term residual control of selected weed species.

Apply 12 to 16 ounces of this product plus 0.25 lb a.e. of Banvel or 0.5 pound a.e. of 2,4-D amine, plus 0.5 to 1 percent nonionic surfactant by total spray volume per acre to control dense populations of the following annual broadleaf weeds when less than 6 inches in height:

Kochia* <i>Kochia scoparia</i>	Pigweed, redroot <i>Amaranthus retroflexus</i>
Lambsquarters <i>Chenopodium album</i>	Thistle, Russian <i>Salsola kali</i>
Lettuce, prickly <i>Lactuca serriola</i>	

*Controlled with Banvel tank mixture only

HIGH-VOLUME BROADCAST APPLICATIONS

When applied as directed under the conditions described, this product will control the weeds listed below when water carrier volumes are 10 to 40 gallons per acre for ground applications.

Use 1 quart of this product per acre if weeds are less than 6 inches tall. If weeds are over 6 inches tall, use 1.5 quarts of this product per acre. If weeds have been mowed, grazed, or cut allow adequate time for new growth to recommended stages prior to treatment. These rates will also provide control of weeds listed in the "Low-Volume Broadcast Application" section.

WEED SPECIES

Balsamapple* <i>Momordica charantia</i>	Panicum <i>Panicum spp.</i>
Bassia, fivehook <i>Bassia hyssopifolia</i>	Ragweed, common <i>Ambrosia artemisiifolia</i>
Brome <i>Bromus spp.</i>	Ragweed, giant <i>Ambrosia trifida</i>
Fiddleneck <i>Amsinckia spp.</i>	Smartweed, Pennsylvania <i>Polygonum pensylvanicum</i>
Flaxleaf Fleabane <i>Conyza bonariensis</i>	Sowthistle, annual <i>Sonchus oleraceus</i>
Fleabane <i>Erigeron spp.</i>	Sunflower <i>Helianthus annuus</i>
Kochia <i>Kochia scoparia</i>	Thistle, Russian <i>Salsola kali</i>
Lettuce, prickly <i>Lactuca serriola</i>	Velvetleaf <i>Abutilon theophrasti</i>

*Apply with hand-held equipment only.

PERENNIAL WEEDS

Apply this product as follows to control or destroy most perennial weeds:

NOTE: If weeds have been mowed or tilled, do not treat until plants have resumed active growth and are at the recommended stages.

Repeat treatments may be necessary to control weeds regenerating from underground parts or seed. Repeat treatments must be made prior to crop emergence.

The addition of 2 percent dry ammonium sulfate by weight or 17 pounds per 100 gallons of water may increase the performance of this herbicide on perennial weeds. The improvement in performance may be apparent where environmental stress is a concern. Refer to the "Mixing, Additives and Application Instructions" section of this label.

When applied as recommended under the conditions described, this product WILL CONTROL the following PERENNIAL WEEDS:

Alfalfa <i>Medicago sativa</i>	Horseradish <i>Armoracia rusticana</i>
Alligatorweed* <i>Alternanthera philoxeroides</i>	Johnsongrass <i>Sorghum halepense</i>
Artichoke, Jerusalem <i>Helianthus tuberosus</i>	Kikuyugrass <i>Pennisetum clandestinum</i>
Bahiagrass <i>Paspalum notatum</i>	Knapweed <i>Centaurea repens</i>
Bentgrass <i>Agrostis spp.</i>	Lantana <i>Lantana camara</i>
Bermudagrass <i>Cynodon dactylon</i>	Milkweed <i>Asclepias spp</i>
Bindweed, field <i>Convolvulus arvensis</i>	Muhly, wirestem <i>Muhlenbergia frondosa</i>
Bluegrass, Kentucky <i>Poa spp.</i>	Mullein, common <i>Verbascum thapsus</i>

Blueweed, Texas <i>Helianthus ciliaris</i>	Napiergrass <i>Pennisetum purpureum</i>
Brackenfern <i>Pteridium aquilinum</i>	Nightshade, silverleaf <i>Solanum elaeagnifolium</i>
Bromegrass, smooth <i>Bromus inermis</i>	Nutsedge, purple, yellow <i>Cyperus rotundus</i> <i>Cyperus esculentus</i>
Bursage, woollyleaf <i>Franseria tomentosa</i>	Orchardgrass <i>Dactylis glomerata</i>
Canarygrass, reed <i>Phalaris arundinacea</i>	Pampas <i>Cortaderia jubata</i>
Cattail <i>Typha spp.</i>	Paragrass <i>Brachiaria mutica</i>
Clover, red <i>Trifolium pratense</i>	Phragmites* <i>Phragmites spp.</i>
Clover, white <i>Trifolium repens</i>	Quackgrass <i>Agropyron repens</i>
Cogongrass <i>Imperata cylindrica</i>	Ryegrass, perennial <i>Lolium perenne</i>
Dallisgrass <i>Paspalum dilatatum</i>	Smartweed, swamp <i>Polygonum coccineum</i>
Dandelion <i>Taraxacum officinale</i>	Sweet potato, wild* <i>Ipomoea pandurata</i>
Dock, curly <i>Rumex crispus</i>	Thistle, Canada <i>Cirsium arvense</i>
Dogbane, hemp <i>Apocynum cannabinum</i>	Timothy <i>Phleum pratense</i>
Fescues <i>Festuca spp.</i>	Torpedograss* <i>Panicum repens</i>
Fescue, tall <i>Festuca arundinacea</i>	Vaseygrass <i>Paspalum urvillei</i>
Guineagrass <i>Panicum maximum</i>	Wheatgrass, western <i>Agropyron smithii</i>
Horsenettle <i>Solanum carolinense</i>	

*Partial Control

See "Directions for Use" and "Mixing, Additives and Application Instructions" sections of this label for labeled uses and specific application instructions.

Alfalfa—Apply 1 quart of this product per acre plus 0.5 to 1 percent nonionic surfactant by total spray volume in 3 to 10 gallons of water per acre. Make application after the last hay cutting in the fall. Allow alfalfa to regrow to a height of 6 to 8 inches or more prior to treatment. Applications should be followed with deep tillage at least 7 days after treatment, but before soil freeze-up.

Alligatorweed—Apply 4 quarts of this product per acre or apply a 1½ percent solution with hand-held equipment to provide partial control. Apply when most of the plants are in bloom. Repeat applications will be required to maintain such control.

Bentgrass—For suppression in grass seed production areas. For ground applications only, apply 1.5 quarts of this product plus 0.5 to 1 percent nonionic surfactant by total spray volume in 10 to 20 gallons of water per acre. Ensure entire crown area has resumed growth prior to a fall application. Bentgrass should be actively growing and have at least 3 inches of growth. Tillage prior to treatment should be avoided. Tillage 7 to 10 days after application is recommended for best results. Failure to use tillage after treatment may result in unacceptable control.

Bermudagrass—For control, apply 5 quarts of this product per acre and for partial control, apply 3 quarts

per acre. Treat when bermudagrass is actively growing and seedheads are present. Retreatment may be necessary to maintain control. Allow 7 or more days after application before tillage.

Bindweed, field/Blueweed, Texas—Apply 4 to 5 quarts of this product per acre west of the Mississippi River and 3 to 4 quarts per acre east of the Mississippi River. Apply when weed is actively growing and is at or beyond full bloom. Do not treat when weed is under drought stress as good soil moisture is necessary for active growth. New leaf development indicates active growth. For best results, apply in late summer or fall. Fall treatments must be applied before a killing frost. Allow 7 or more days after application before tillage.

Bindweed, field (suppression irrigated lands where annual tillage is performed)—Apply 1 quart of this product plus 0.5 to 1 percent nonionic surfactant by total spray volume in 3 to 10 gallons of water per acre. Apply to actively growing bindweed that has reached a length of 12 inches or greater. Allow maximum weed emergence and runner growth. Do not treat when weed is under drought stress as good soil moisture is necessary for active growth. Allow 3 or more days after application before tillage.

Bluegrass, Kentucky / Bromegrass, smooth / Orchardgrass—Apply 2 quarts of this product in 10 to 40 gallons of water per acre when the grasses are actively growing and most plants have reached boot-to-early seedhead stage of development. For partial control in pasture or hay crop renovation apply 1 to 1½ quarts of this product plus 0.5 to 1 percent nonionic surfactant by total spray volume in 3 to 10 gallons of water per acre. Apply to actively growing plants when most have reached 4 to 12 inches in height. Allow 7 or more days after application before tillage.

Orchardgrass (sods going to no-till corn)—Apply 1 to 1.5 quarts of this product per acre plus 0.5 to 1 percent nonionic surfactant by total spray volume in 3 to 10 gallons of water per acre. Apply to orchardgrass that is a minimum of 12 inches tall for spring applications and 6 inches tall for fall applications. Allow at least three days following application before planting. A sequential application of 3.75 to 4.5 quarts of Lariat® herbicide, or equivalent, will be necessary for optimum results. Lariat should be applied within 3 to 10 days following spring applications to prevent annual weed growth.

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Brackenfern—Apply 3 to 4 quarts of this product per acre as a broadcast spray or as a 1 to 1½ percent solution with hand-held equipment. Apply to fully expanded fronds which are at least 18 inches long.

Bursage, woollyleaf—For control apply 2 quarts of this product plus 1 pint of Banvel per acre. For partial control apply 1 quart of this product plus 1 pint of Banvel per acre. Add 0.5 to 1 percent nonionic surfactant by total spray volume and apply 3 to 20 gallons of water per acre. Apply when plants are producing new active growth which has been initiated by moisture for at least 2 weeks and when plants are at or beyond flowering.

Canarygrass, reed/Timothy / Wheatgrass, western—Apply 2 to 3 quarts of this product per acre. For best results, apply to actively growing plants when most have reached the boot-to-head stage of growth. Allow 7 or more days after application before tillage.

Cogongrass—Apply 3 to 5 quarts of this product plus 0.5 to 1 percent nonionic surfactant in 10 to 40 gallons of water per acre. Apply when Cogongrass is at least 18

inches tall and actively growing in late summer or fall. Allow 7 or more days after application before tillage or mowing. Due to uneven stages of growth and the dense nature of vegetation preventing good spray coverage, repeat treatments may be necessary to maintain control.

Dogbane, hemp/Knapweed/Horseradish—Apply 4 quarts of this product per acre. Apply when actively growing and when most weeds have reached the late bud to flower stage of growth. Following crop harvest or mowing, allow weeds to regrow to a mature stage prior to treatment. For best results, apply in late summer or fall. Allow 7 or more days after application before tillage.

Fescue, tall—Apply 3 quarts of this product in 10 to 40 gallons of water per acre to actively growing plants when most have reached boot-to-early seedhead stage of development.

Fall applications only—Apply 1 quart of this product plus 0.5 to 1 percent nonionic surfactant by total spray volume in 3 to 10 gallons of water per acre. Apply to fescue in the fall when actively growing and plants have 6 to 12 inches of new growth. Allow 7 or more days after application before tillage. A sequential application of 1 pint per acre of this product plus nonionic surfactant will improve long-term control and control seedlings germinating after fall treatments or the following spring.

Guineagrass—Apply 3 quarts of this product per acre or use a 1 percent solution with hand-held equipment. Apply to actively growing guineagrass when most has reached at least the 7-leaf stage of growth. Ensure thorough coverage when using hand-held equipment. Allow 7 or more days after application before tillage.

Johnsongrass/Ryegrass, perennial—Apply 1 to 3 quarts of this product per acre. In annual cropping systems apply 1 to 2 quarts of this product per acre. Apply 1 quart of this product plus 0.5 to 1 percent nonionic surfactant by total spray volume in 3 to 10 gallons of water per acre. Use 2 quarts of this product when applying 10 to 40 gallons of water per acre. In noncrop or areas where annual tillage (no-till), is not performed, apply 2 to 3 quarts of this product in 10 to 40 gallons of water per acre. For best results, apply to actively growing plants when most have reached the boot-to-head stage of growth or in the fall prior to frost. Allow 7 or more days after application before tillage. Do not tank-mix with residual herbicides when using the 1 quart per acre rate.

For burndown of Johnsongrass, apply 1 pint per acre plus 0.5 to 1 percent nonionic surfactant in 3 to 10 gallons of water per acre before the plants reach a height of 12 inches. For this use, allow at least 3 days after treatment before tillage.

Spot Treatment (partial control or suppression)—Apply a 1 percent solution of this product plus 0.5 to 1 percent nonionic surfactant by total spray volume when johnsongrass is 12 to 18 inches in height. Coverage should be uniform and complete.

Kikuyugrass—Apply 2 to 3 quarts of this product per acre. Spray when most kikuyugrass is at least 8 inches in height (3 or 4-leaf stage of growth) and actively growing. Allow 3 or more days after application before tillage.

Lantana—Apply this product as a 1 to 1¼ percent solution using hand-held equipment only. Apply to actively growing lantana at or beyond the bloom stage of growth. Use the higher application rate for plants that have reached the woody stage of growth. Allow 7 or more days after application before tillage.

Milkweed, common—Apply 3 quarts of this product per acre. Apply when actively growing and most of the milkweed has reached the late bud to flower stage of growth. Following small grain harvest or mowing, allow milkweed to regrow to a mature stage prior to treatment. Allow 7 or more days after application before tillage.

Muhly, wirestem—Apply 1 to 2 quarts of this product per acre. Use 1 quart of this product plus 0.5 to 1 percent nonionic surfactant by total spray volume in 3 to 10 gallons of water per acre. Use 2 quarts of this product when applying 10 to 40 gallons of water per acre or in pasture, sod, or noncrop areas. Spray when the wirestem muhly is 8 inches or more in height and actively growing. Do not till between harvest and fall applications or in the fall or spring prior to spring applications. Allow 3 or more days after application before tillage. This product will not provide residual control of wirestem muhly from seeds which germinate after a Roundup herbicide application. Do not tank mix with residual herbicides when using the 1 quart per acre rate.

Nightshade, silverleaf—For control, apply 2 quarts of this product plus 0.5 to 1 percent nonionic surfactant by total spray volume in 3 to 10 gallons of water per acre. Applications should be made when at least 60 percent of the plants have berries. Fall treatments must be applied before a killing frost. Allow 7 or more days after application before tillage. Do not treat when weed is under drought stress as good soil moisture is necessary for active growth.

Nutsedge: purple, yellow—Apply 3 quarts of this product per acre as a broadcast spray, or apply a 1 percent solution from hand-held equipment to control existing nutsedge plants and immature nutlets attached to treated plants. Treat when plants are in flower or when new nutlets can be found at rhizome tips. Nutlets which have not germinated will not be controlled and may germinate following treatment. Repeat treatments will be required for long-term control. Wait 7 days after treatment before tillage. Tillage will stimulate nutlet germination.

Apply 1 pint to 1 quart of this product per acre, plus 0.5 to 1 percent nonionic surfactant in 3 to 40 gallons of water per acre to provide suppression or partial control of existing nutsedge plants. Treat when plants have 3 to 5 leaves (less than 6 inches). Repeat treatments will be required to control subsequent emerging plants. Wait 7 days after treatment before tillage or mowing.

Pampas—Apply this product as a 1½ to 2 percent solution using hand-held equipment. Apply to plants that are actively growing at or beyond the boot stage of growth. Thorough coverage is necessary for best control.

Phragmites—For partial control of phragmites in Florida and the counties of other states bordering the Gulf of Mexico, apply 5 quarts per acre as a broadcast spray or apply a 2 percent solution from hand-held equipment. In other areas of the U.S., apply 3 quarts per acre as a broadcast spray or apply a 1 percent solution from hand-held equipment for partial control. For best results, treat during late summer or fall months or when plants are actively growing and in full bloom. Treatment before or after this stage may lead to reduced control. Due to the dense nature of the vegetation, which may prevent good spray coverage or uneven stages of growth, repeat treatments may be necessary to maintain control. Visual control symptom will be slow to develop.

Quackgrass—In Annual Cropping Systems, or in Pastures and Sods Followed by Deep Tillage: Apply 1 to 2 quarts of this product per acre. For the one quart rate, apply 0.5

to 1 percent nonionic surfactant by total spray volume in 3 to 10 gallons of water per acre. For the 2 quart rate, apply in 10 to 40 gallons of water per acre. Do not tank mix with residual herbicides when using the 1 quart rate. Spray when quackgrass is 8 to 12 inches in height and actively growing. Do not till between harvest and fall applications or in fall or spring prior to spring application. Allow 3 or more days after application before tillage. In pastures or sods, for best results use a moldboard plow.

Quackgrass—Pasture or Sod or Other Noncrop Areas Where Deep Tillage is Not Planned Following Application: Apply 2 to 3 quarts in 10 to 40 gallons of water per acre. Spray when the quackgrass is greater than 8 inches tall and actively growing. Do not till between harvest and fall application or in fall or spring prior to spring application. Allow 3 or more days after application before tillage.

Sweet Potato, wild—Apply this product as a 2 percent solution using hand-held equipment. Apply to actively growing weeds that are at or beyond the bloom stage of growth. Repeat applications will be required. Allow the plant to reach the recommended stage of growth before retreatment. Allow 7 or more days before tillage.

Thistle, Canada—Apply 2 to 3 quarts of this product per acre. Apply to actively growing thistles when most are at or beyond the bud stage of growth. After harvest, mowing or tillage in the late summer or fall, allow at least 4 weeks for initiation of active growth and rosette development prior to the application of this product. Fall treatments must be applied before a killing frost. Allow 3 or more days after application before tillage.

For suppression of Canada thistle, apply 1 quart per acre of this product plus 0.5 to 1 percent nonionic surfactant by total spray volume in 3 to 10 gallons of water per acre in the late summer or fall after harvest, mowing or tillage. Allow rosette regrowth to a minimum of 6 inches in diameter before treating. Applications can be made as long as leaves are still green and plants are actively growing at the time of application. Allow 3 or more days after application before tillage.

Torpedograss—Apply 4 to 5 quarts of this product per acre to provide partial control of torpedograss. Apply to actively growing torpedograss when most plants are at or beyond the seedhead stage of growth. Repeat applications will be required to maintain control. Fall treatments must be applied before frost. Allow 7 or more days after application before tillage.

Other perennials listed on this label—Apply 3 to 5 quarts of this product per acre. Apply when actively growing and most have reached early head or early bud stage of growth. Allow 7 or more days after application before tillage.

TANK MIXTURES

When applied as directed, under the conditions described, Roundup plus Banvel or 2,4-D amine will suppress or control the following perennial broadleaf weed.

Bindweed, field *Convolvulus arvensis*

For suppression, apply 16 ounces of this product plus 0.5 lb a.e. of 2,4-D amine or 0.25 lb a.i. of Banvel, plus 0.5 to 1 percent nonionic surfactant by total spray volume in 3 to 10 gallons of water per acre for ground applications and 3 to 5 gallons of water per acre for aerial applications. Applications should be delayed until maximum emergence has occurred and when vines are between 6 to 18 inches in length. These tank mixtures may be applied using aerial application equipment (except in California) in fallow and reduced tillage systems only.

For control, apply 2 quarts of this product plus 0.5 pound a.i. of Banvel in 10 to 20 gallons of water per acre. At these rates, apply using ground application equipment only.

Irrigated Agricultural Lands

Apply 1 to 2 quarts of this product plus 1 quart per acre of 2,4-D amine in 10 to 20 gallons of water per acre with ground equipment only for partial control (suppression) of field bindweed. Applications should be made following harvest or in fall fallow ground when the bindweed is actively growing and the majority of runners are 12 inches or more in length. The use of at least one irrigation will promote active bindweed growth.

Dogbane, hemp
Apocynum cannabinum

For suppression, apply 16 ounces of this product plus 16 ounces of 2,4-D amine plus 0.5 to 1 percent nonionic surfactant by total spray volume in 3 to 10 gallons of water per acre for ground applications and 3 to 5 gallons of water per acre for aerial applications. Delay applications until maximum emergence of dogbane has occurred. For control, apply 4 quarts of this product in 3 to 20 gallons of water using ground application equipment only.

Smartweed, Swamp
Polygonum coccineum

For control, apply 16 ounces of this product plus 0.5 pounds active ingredient of 2,4-D amine plus 0.5 to 1 percent nonionic surfactant by total volume in 3 to 10 gallons of water per acre in the late summer or fall. Apply when plants are actively growing and most have reached the early bud stage of growth. Allow 7 or more day after application before tillage.

Refer to the specific product labels for crop rotation restrictions and cautionary statements of all products in tank mixture.

WOODY BRUSH AND TREES

When applied as recommended under the conditions described, this product CONTROLS or PARTIALLY CONTROLS the following woody brush, plants and trees:

Alder <i>Alnus spp.</i>	Monkey Flower* <i>Mimulus guttatus</i>
Ash* <i>Fraxinus spp.</i>	Oak:
Aspen, quaking <i>Populus tremuloides</i>	Black* <i>Quercus velutina</i>
Bearmat (Bearclover) <i>Chamaebatia foliolosa</i>	Northern Pin <i>Quercus palustris</i>
Birch <i>Betula spp.</i>	Post <i>Quercus stellata</i>
Blackberry <i>Rubus spp.</i>	Red <i>Quercus rubra</i>
Broom:	Southern Red <i>Quercus falcata</i>
French <i>Cytisus monspessulanus</i>	White* <i>Quercus alba</i>
Scotch <i>Cytisus scoparius</i>	Persimmon* <i>Diospyros spp</i>
Buckwheat, California* <i>Eriogonum fasciculatum</i>	Poison Ivy <i>Rhus radicans</i>
Cascara* <i>Rhamnus purshiana</i>	Poison Oak <i>Rhus toxicodendron</i>
Catsclaw* <i>Acacia greggii</i>	Poplar*, yellow <i>Liriodendron tulipifera</i>

Ceanothus* <i>Ceanothus spp.</i>	Raspberry <i>Rubus spp.</i>
Chamise <i>Adenostoma fasciculatum</i>	Rose, multiflora <i>Rosa multiflora</i>
Cherry:	Sage, black <i>Salvia mellifera</i>
Bitter <i>Prunus emarginata</i>	Sagebrush, California <i>Artemisia californica</i>
Black <i>Prunus serotina</i>	Salmonberry <i>Rubus spectabilis</i>
Pin <i>Prunus pensylvanica</i>	Sassafras <i>Sassafras albidum</i>
Coyote brush <i>Baccharis consanguinea</i>	Sourwood <i>Oxydendrum arboreum</i>
Creeper, Virginia* <i>Parthenocissus quinquefolia</i>	Sumac:
Dewberry <i>Rubus trivialis</i>	Poison* <i>Rhus vernix</i>
Elderberry <i>Sambucus spp.</i>	Smooth* <i>Rhus glabra</i>
Elm* <i>Ulmus spp.</i>	Winged* <i>Rhus copallina</i>
Eucalyptus, Bluegum <i>Eucalyptus glotulus</i>	Sweetgum <i>Liquidambar styraciflua</i>
Hasardia* <i>Haplopappus squamosus</i>	Swordfern* <i>Polystichum munitum</i>
Hawthorn <i>Crataegus spp.</i>	Tallowtree, Chinese <i>Sapium sebiferum</i>
Hazel <i>Corylus spp.</i>	Tan Oak <i>Lithocarpus densiflorus</i>
Honeysuckle <i>Lonicera spp.</i>	Thimbleberry <i>Rubus parviflorus</i>
Kudzu <i>Pueraria lobata</i>	Tobacco, tree* <i>Nicotiana glauca</i>
Locust, black* <i>Robinia pseudoacacia</i>	Trumpetcreeper <i>Campsis radicans</i>
Madrone <i>Arbutus menziesii</i>	Willow <i>Salix spp.</i>
Manzanita <i>Arctostaphylos spp.</i>	

Maple:
Red** <i>Acer rubrum</i>
Sugar <i>Acer saccharum</i>
Vine* <i>Acer circinatum</i>

*Partial control
**See below for control or partial control instructions.

NOTE: If brush has been mowed or tilled or trees have been cut, do not treat until regrowth has reached the recommended stages of growth.

Apply this product when plants are actively growing, and unless otherwise directed, after full leaf expansion. Use the higher rate for larger plants and/or dense areas of growth. On vines, use the higher rate for plants that have reached the woody stage of growth. Best results are obtained when application is made in late summer or fall after fruit formation

In arid areas, best results are obtained when application is made in the spring to early summer when brush species are at high moisture content and are flowering

Ensure thorough coverage when using hand-held equipment. Symptoms may not appear prior to frost or senescence with fall treatments.

Allow 7 or more days after application before tillage, mowing or removal. Repeat treatments may be necessary to control plants regenerating from underground parts or seed. Some autumn colors on undesirable deciduous species are acceptable provided no major leaf drop has occurred. Reduced performance may result if fall treatments are made following a frost.

See "Directions for Use", and "Mixing, Additives, and Application Instructions" sections of this label for labeled uses and specific application instructions.

Apply this product as follows to control or partially control the following woody brush and trees.

Alder/Dewberry/Honeysuckle/Post Oak/Raspberry—For control, apply 3 to 4 quarts per acre of this product as a broadcast spray or as a 1 to 1½ percent solution with hand-held equipment.

Aspen, quaking/Cherry: bitter, black, pin/Hawthorn /Oak, southern red/Sweetgum/Trumpetcreeper— For control, apply 2 to 3 quarts of this product per acre as a broadcast spray or as a 1 to 1½ percent solution with hand-held equipment.

Birch/Elderberry/Hazel/Salmonberry/ Thimbleberry— For control, apply 2 quarts per acre of this product as a broadcast spray or as a 1 percent solution with hand-held equipment.

Blackberry—For control, apply 3 to 4 quarts per acre of this product as a broadcast spray, or 1 to 1½ percent solution with hand-held equipment. Make application after plants have reached full leaf maturity. Best results are obtained when applications are made in late summer or fall. After berries have set or dropped in late fall, blackberry can be controlled by applying a 3/4 percent solution of this product plus 0.5 to 1 percent nonionic surfactant by total spray volume with hand-held equipment. For control of blackberries after leaf drop and until killing frost or as long as stems are green, apply 3 to 4 quarts of this product in 10 to 40 gallons of water per acre.

Broom: French, Scotch—For control, apply a 1½ to 2 percent solution with hand-held equipment.

Buckwheat, California/Hasardia/Monkey Flower/ Tobacco, tree—For partial control of these species, apply a 1 to 2 percent solution of this product as a foliar spray with hand-held equipment. Thorough coverage of foliage is necessary for best results.

Catsclaw—For partial control, apply as a 1 to 1½ percent solution with hand-held equipment.

Coyote Brush—For control, apply a 1½ to 2 percent solution with hand-held equipment when at least 50 percent of the new leaves are fully developed

Eucalyptus/Bluegum—For control of eucalyptus resprouts, apply a 2 percent solution of this product with hand-held equipment when resprouts are 6 to 12 feet tall. Ensure complete coverage. Apply when plants are growing actively. Avoid application to drought stressed plants.

Kudzu—For control, apply 4 quarts of this product per acre as a broadcast spray or as a 2 percent solution with hand-held equipment. Repeat applications will be required to maintain control.

Maple, red**—For control, apply as a 1 to 1½ percent solution with hand-held equipment when at least 50 per

cent of the new leaves are fully developed. For partial control, apply 2 to 4 quarts of this product per acre as a broadcast spray.

Maple, sugar/Oak, northern pin/Oak red—For control, apply as a 1 to 1½ percent solution with hand-held equipment when at least 50 percent of the new leaves are fully developed.

Poison Ivy/Poison Oak—For control, apply 4 to 5 quarts of this product per acre as a broadcast spray or as a 2 percent solution with hand-held equipment. Repeat applications may be required to maintain control. Fall treatments must be applied before leaves lose green color.

Rose, multiflora—For control, apply 2 quarts of this product per acre as a broadcast spray or as a 1 percent solution with hand-held equipment. Treatments should be made prior to leaf deterioration by leaf-feeding insects.

Sage, black/Sagebrush, California/Chamise/Tallowtree, Chinese—For control of these species, apply a 1 percent solution of this product as a foliar spray with hand-held equipment. Thorough coverage of foliage is necessary for best results.

Willow—For control, apply 3 quarts of this product per acre as a broadcast spray or as a 1 percent solution with hand-held equipment.

Other Woody Brush and Trees listed on this label—For partial control, apply 2 to 4 quarts of this product per acre as a broadcast spray or as a 1 to 2 percent solution with hand-held equipment.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in any manner inconsistent with its labeling.

Storage and Disposal

Do not contaminate water, foodstuffs, seed or feed by storage or disposal.

See container label for STORAGE AND DISPOSAL instructions.

NONCROP USES

See "General Information" and "Mixing, Additives and Application Instructions" sections of this label for essential product performance information and the following "Noncrop" sections for specific recommended uses.

EXTREME CARE MUST BE EXERCISED TO AVOID CONTACT OF SPRAY WITH FOLIAGE OF DESIRABLE TURFGRASSES, TREES, SHRUBS, OR OTHER DESIRABLE VEGETATION SINCE SEVERE DAMAGE OR DESTRUCTION MAY RESULT.

NOTE: If spraying areas adjacent to desirable plants, use a shield made of cardboard, sheet metal or plywood while spraying to help prevent spray from contacting foliage of desirable plants.

Repeat treatments may be necessary to control weeds regenerating from underground parts or seeds.

Roundup herbicide does not provide residual weed control. For subsequent weed control, follow a label-approved herbicide program.

Read and carefully observe the cautionary statements and all other information appearing on the labels of all herbicides used.

INDUSTRIAL, RECREATIONAL AND PUBLIC AREAS

When applied as directed for "Noncrop Uses", under conditions described, this product controls annual and perennial weeds listed on this label growing in areas such as airports, ditch banks, dry ditches, dry canals, fence-rows, golf courses, highways, industrial plant sites, lumber yards, parking areas, parks, petroleum tank farms and pumping installations, pipelines, power and telephone rights-of-way, railroads, roadsides, schools, storage areas, other public areas and similar industrial or non-crop areas.

For specific rates of application and instructions for control of various annual and perennial weeds and woody brush and trees, see the "Weeds Controlled" section of this label.

This product may be applied with recirculating sprayers, shielded applicators, or wiper applicators in any noncrop site specified on this label. See the "Selective Equipment part of "Application Equipment and Techniques" section of this label for information on proper use and calibration of this equipment.

TANK MIXTURES FOR INDUSTRIAL SITES AND FORESTRY SITE PREPARATIONS

ROUNDUP® plus OUST™

Use on industrial sites including airports, industrial plants, lumberyards, petroleum tank farms, pumping stations, pipelines, railroads, roadsides, storage areas or other similar sites where bare ground is desired.

This tank mixture may also be used as a site preparation treatment for sites to be planted to jack pine, loblolly pine, red pine, slash pine and Virginia pine.

When applied as directed for "Noncrop Uses" under the conditions described, this product plus Oust provides control of annual weeds listed in the "Weeds Controlled" section of the label for this product and Oust, and control or partial control of the perennial weeds listed below.

Apply 1 to 2 quarts of this product with 2 to 4 ounces of Oust in 10 to 40 gallons of spray solution per acre as a broadcast spray to actively growing weeds.

This mixture may be applied by aerial equipment in site prep operations. When applied by air, use the recommended rates in 5 to 15 gallons of spray solution per acre.

For control of annual weeds, use the lower rates of these products.

For control of the listed perennial weeds, use the higher rates of both products. For partial control, use the lower rates.

Bahiagrass

Paspalum notatum

Bermudagrass*

Cynodon dactylon

Broomsedge

Andropogon virginicus

Dock, curly

Rumex crispus

Dogfennel

Eupatorium capilliflorum

Johnsongrass**

Sorghum halepense

Poorjoe**

Diodia teres

Quackgrass

Agropyron repens

Trumpet creeper*

Campsis radicans

Vaseygrass

Paspalum urvillei

Fescue, tall

Festuca arundinacea

Vervain, blue

Verbena hastata

*Suppression at the higher rates only

**Control at the lower rates

Read and carefully observe the cautionary statements and all other information appearing on the labels of all herbicides used.

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TANK MIXTURES NONCROP SITES

When applied as a tank mixture, this product provides control of the emerged annual weeds and partial control of the emerged perennial weeds listed in this label. When applied as a tank mixture, the following residual herbicides will provide preemergence control of the weeds listed in the individual product labels.

ROUNDUP plus DIURON

ROUNDUP® plus KROVAR™ I

ROUNDUP plus KROVAR II

ROUNDUP plus RONSTAR™ 50WP

ROUNDUP plus SIMAZINE, CALIBER™ 90

ROUNDUP plus SIMAZINE 4L

ROUNDUP plus SIMAZINE 80W

ROUNDUP plus SURFLAN™ 75W

ROUNDUP plus SURFLAN AS

When tank mixing with residual herbicides, add an agriculturally approved nonionic surfactant at 0.5 to 1 percent by volume of spray solution. See the "Mixing, Additives and Application Instructions" section of this label before preparing these tank mixtures.

Read and carefully observe the label claims, cautionary statements, recommended use rates and all other information on the labels of all products used in these tank mixtures. Use according to the most restrictive label directions for each product in the mixture.

CONTROL OF EMERGED WEEDS

Annual Weeds—Apply 1 quart per acre of this product in these tank mixtures when weeds are less than 6 inches tall and 1½ quarts per acre when weeds are more than 6 inches tall.

Perennial Weeds—For partial control of perennial weeds using these tank mixtures, apply 2 to 5 quarts per acre of this product. Follow the recommendations in the "Weeds Controlled" section of this label for stage of growth and rate of application for specific perennial weeds.

PREEMERGENCE WEED CONTROL

The following are the labeled rates for the recommended residual herbicides for noncrop uses:

PRODUCT	RATE/ACRE
Diuron, Karmex™ 50WP	2 to 8 lbs
Krovar I	4 to 6 lbs
Krovar II	2 to 5 lbs
Ronstar 50WP	4 to 8 lbs
Simazine, Caliber 90	5.3 to 11.1 lbs
Simazine 80W	6 to 12½ lbs
Simazine 4L	4.8 to 10 qts
Surflan 75W	2½ to 5½ lbs
Surflan AS	2 to 4 qts

Refer to the individual product labels for specific non-crop sites, rates, carrier volumes and precautionary statements.

Mix only the quantity of spray solution which can be used during the same day. Do not allow these tank mixtures to stand overnight as this may result in reduced weed control.

APPLY THESE TANK MIXTURES THROUGH CONVENTIONAL BROADCAST EQUIPMENT ONLY.

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TMKarmex and TMKrovax are trademarks of E.I. du Pont de Nemours and Company.

TMRonstar is a trademark of Rhone-Poulenc, Inc.

TMSurflan is a trademark of Elanco Products Company.

FARMSTEAD WEED CONTROL

When applied as directed for "Noncrop Uses", under conditions described, this product controls undesirable vegetation listed on this label around farmstead building foundations, along and in fences, shelterbelts, and for general nonselective farmstead weed control.

For specific rates of application and instructions for control of various annual and perennial weeds, see the "Weeds Controlled" section of this label.

ORNAMENTALS

THIS PRODUCT IS NOT RECOMMENDED FOR USE AS AN OVER-THE-TOP BROADCAST SPRAY IN ORNAMENTALS.

When applied as directed for the conditions described for "Noncrop Uses", this product controls undesirable vegetation listed on this label prior to planting ornamentals, in established ornamentals, and within and around greenhouses and shadehouses.

For specific rates of application and instructions for control of various annual and perennial weeds, see the "Weeds Controlled" section of this label.

Where repeat applications are necessary, do not exceed 10.6 quarts of this product per acre per year.

Site Preparation—Following preplant applications of this product, any ornamental species may be planted. Precautions should be taken to protect nontarget plants during site preparation applications.

Greenhouse/Shadehouse Use—This product may be used to control weeds listed on this label which are growing in greenhouses. Desirable vegetation must not be present during application and air circulation fans must be turned off.

Postdirected Spray—Use as a directed spray toward the base of established woody ornamentals species listed below.

Arborvitae

Thuja spp.

Azalea

Rhododendron spp.

Boxwood

Buxus spp.

Crabapple

Malus spp.

Euonymus

Euonymus spp.

Fir

Abies spp.

Pseudotsuga spp.

Lilac

Syringa spp.

Magnolia

Magnolia spp.

Maple

Acer spp.

Oak

Quercus spp.

Privet

Ligustrum spp.

Pine

Pinus spp.

Hollies

Ilex spp.

Spruce

Picea spp.

Yew

Taxus spp.

SILVICULTURAL SITES, RIGHTS-OF-WAY and CHRISTMAS TREES

NOTE: NOT RECOMMENDED FOR USE AS AN OVER-THE-TOP BROADCAST SPRAY IN SILVICULTURAL NURSERIES, OR CHRISTMAS TREE PLANTATIONS.

When applied as directed for "Noncrop Uses" under conditions described, this product controls undesirable vegetation listed on this label. This product also suppresses or controls undesirable vegetation listed on this label when applied at recommended rates for release of established coniferous species listed on this label.

For specific rates of application and instructions for control of various brush, annual and perennial weeds, see the "Weeds Controlled" section of this label. For specific rates of application for release of listed coniferous species, see the "Conifer Release" part of this section of the label.

Where repeat applications are necessary, do not exceed 10.6 quarts of this product per acre per year.

Aerial Application—This product may be applied using aerial spray equipment for silvicultural site preparation, conifer release and rights-of-way treatments. See the "Application Equipment and Techniques" part of the "Mixing, Additives and Application Instruction" section of this label for information on how to properly spray this product by air.

DO NOT APPLY THIS PRODUCT BY AIR TO RIGHTS-OF-WAY SITES IN THE STATE OF CALIFORNIA.

In order to reduce the aerial application drift hazard to aquatic sites*, to nontarget sites, or any site containing desirable vegetation, always maintain appropriate buffer zones. A buffer zone of the following minimum distances should be maintained:

- Helicopters using a MicrofoilTM boom, a Thru-ValveTM boom (TVB-45), or equivalent drift control systems, should maintain at least a 50-foot buffer zone.
- When using other aerial equipment:
 1. Maintain at least a 75-foot buffer zone for applications using 2 quarts or less per acre of this product.
 2. Maintain at least a 125-foot buffer zone for application using more than 2 quarts per acre of this product.
 3. Maintain at least a 400-foot buffer zone for applications on rights-of-way when applied from 75 feet or more above ground level.

These distances should be increased if conditions favoring drift exist.

*Aquatic sites include all lakes, ponds, and streams used for significant domestic purposes or angling.

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TMThru-Valve is a trademark of Waldrum Specialties, Inc.

SITE PREPARATION

Following preplant applications of this product, any silvicultural species may be planted

POSTDIRECTED SPRAY

In established silvicultural sites, use as a spray on the

foliage of undesirable vegetation. Care must be exercised to avoid contact of spray, drift or mist with foliage or green bark of desirable species.

CONIFER RELEASE

For release, apply only where conifers have been established for more than one year. Vegetation should not be disturbed prior to treatment or until visual symptoms appear after treatment. Symptoms of treatment are slow to appear, especially in woody species treated in late fall. Injury may occur to conifers treated for release, especially where spray patterns overlap or the higher rates are applied or when applications are made during periods of active conifer growth. **Do not use additional surfactant with conifer release applications.**

Applications must be made after formation of final conifer resting buds in the fall or prior to initial bud swelling in spring. Some autumn colors on undesirable deciduous species are acceptable provided no major leaf drop has occurred. Use the following rates for conifer release to control or partially control the weeds listed in the "Weeds Controlled" section of this label.

For release of the following conifer species:

Douglas fir

Pseudotsuga menziesii

Fir

Abies spp.

Pines*

Pinus spp.

Spruce

Picea spp.

Hemlock

Tsuga spp.

*Includes all species except eastern white pine, loblolly pine or slash pine.

Apply 1½ to 2 quarts of this product per acre except in Washington and Oregon, west of the crest of the Cascade Mountains. For spring treatments west of the crest of the Cascade Mountains, apply 1 quart of this product per acre before conifer bud swell for control of annual weeds. For fall treatments in Washington and Oregon, west of the crest of the Cascade Mountains, apply 1 to 1½ quarts of this product per acre before any major leaf drop of deciduous species.

For release of western hemlock apply 1 quart of this product per acre.

For release of the following conifer species:

Loblolly pine

Pinus taeda

Slash pine

Pinus ellottii

Eastern white pine

Pinus strobus

Late Season Application—Apply 1½ to 2 quarts of this product in a minimum of 5 gallons of spray solution per acre during early autumn. Applications made prior to September 1 or when conditions are conducive to rapid growth of conifers will result in potential for increased injury in the form of tip and/or needle burn. Injury may decrease with later applications. Some autumn colors are acceptable at time of application. Apply prior to frost or leaf drop of undesirable plants. Applications made according to label direction will release loblolly pine, eastern white pine and slash pine by reducing competition from the following species:

Ash

Fraxinus spp.

Cherry:

Black

Prunus serotina

Pin

Prunus pensylvanica

Persimmon

Diospyros spp.

Poplar, yellow

Liriodendron tulipifera

Sassafras

Sassafras albidum

Elm <i>Ulmus spp.</i>	Sourwood <i>Oxydendrum arboreum</i>
Hawthorn <i>Crataegus spp.</i>	Sumac: Poison <i>Rhus vernix</i>
Locust, black <i>Robinia pseudoacacia</i>	Smooth <i>Rhus glabra</i>
Maple, red <i>Acer rubra</i>	Winged <i>Rhus copallina</i>
Oak: Black <i>Quercus velutina</i>	Sweetgum <i>Liquidambar styraciflua</i>
Post <i>Quercus stellata</i>	
Southern Red <i>Quercus falcata</i>	
White <i>Quercus alba</i>	

Apply only to those sites where woody brush and trees listed in this label constitute the majority of the undesirable species.

■ Roundup plus Oust Tank Mixtures for Conifer Release from Herbaceous Weeds ■

To release **loblolly pines** from herbaceous weeds, tank mixtures of this product with Oust will provide control of annual weeds listed in the "Weeds Controlled" section of this and the Oust label, and partial control of the perennial weeds listed below.

Apply 16 to 24 fluid ounces of Roundup with 2 to 4 ounces of Oust in 10 to 30 gallons of spray solution per acre. Make application to actively growing weeds as a broadcast spray over the top of the young loblolly pines.

This tank mixture may be applied using aerial equipment. When applying by air, use the recommended rate in 5 to 15 gallons of spray solution per acre.

For control of annual weeds below 12 inches in height (or runner length on annual vines) use the low rates of both products. Use the higher rates of both products when annual weeds are in more advanced stages of growth and approaching flower or seed formation.

Use the higher rates of both products for partial control of the following perennial weeds. Use the lower rates for suppression of growth.

Bahiagrass <i>Paspalum notatum</i>	Johnsongrass** <i>Sorghum halepense</i>
Broomsedge <i>Andropogon virginicus</i>	Poorjoe** <i>Diodia teres</i>
Dock, curly <i>Rumex crispus</i>	Trumpetcreeper* <i>Campsis radicans</i>
Dogfennel <i>Eupatorium capilliflorum</i>	Vaseygrass <i>Paspalum urvillei</i>
Fescue, tall <i>Festuca arundinacea</i>	Vervain, blue <i>Verbena hastata</i>

*Suppression at the higher rates only.

**Control at the higher rates.

Pine damage may occur or can be accentuated if treatment takes place when young trees are under stress from drought, flood water, insects or disease.

Read and observe the cautionary statements and all other information appearing on the label of all herbicides used.

NOTE TO USER

This product must not be used in areas where adverse impact on Federally designated endangered/threatened plant or aquatic species is likely.

Prior to making applications, the user of this product must determine that no such species are located in or immediately adjacent to the area to be treated.

■ CUT STUMP TREATMENTS ■

Woody vegetation may be controlled by treating freshly cut stumps of trees and resprouts with this product. Apply this product using suitable equipment to ensure coverage of the entire cambium. Cut vegetation close to the soil surface. Apply a 50 to 100 percent solution of this product to the freshly cut surface immediately after cutting. Delays in application may result in reduced performance. For best results, applications should be made during periods of active growth and full leaf expansion.

When used according to directions for cut stump application, this product will CONTROL, PARTIALLY CONTROL or SUPPRESS many types of woody brush and tree species, some of which are listed below:

Alder <i>Alnus spp.</i>	Saltcedar <i>Tamarisk spp.</i>
Eucalyptus/Bluegum <i>Eucalyptus glotulus</i>	Sweetgum <i>Liquidambar styraciflua</i>
Madrone <i>Arbutus menziesii</i>	Tan Oak <i>Lithocarpus densiflorus</i>
Oak <i>Quercus spp.</i>	Willow <i>Salix spp.</i>
Reed, giant <i>Arundo donax</i>	

■ INJECTION AND FRILL APPLICATIONS ■

Woody vegetation may be controlled by injection or frill application of this product. Apply this product using suitable equipment which must penetrate into the living tissue. Apply the equivalent of 1 ml of this product per each 2 to 3 inches of trunk diameter. This is best achieved by applying 50 to 100 percent concentration of this material either to a continuous frill around the tree or as cuts evenly spaced around the tree below all branches. As tree diameter increases in size, better results are achieved by applying diluted material to a continuous frill or more closely spaced cuttings. Avoid application techniques that allow runoff to occur from frill or cut areas in species that exude sap freely after frills or cutting. In species such as this, make frill or cut at an oblique angle so as to produce a cupping effect and use undiluted material. For best results, application should be made during periods of active growth and after full leaf expansion.

This treatment WILL CONTROL the following woody species:

Oak <i>Quercus spp.</i>	Sweetgum <i>Liquidambar styraciflua</i>
Poplar <i>Populus spp.</i>	Sycamore <i>Platanus occidentalis</i>

This treatment WILL SUPPRESS the following woody species:

Black gum <i>Nyssa sylvatica</i>	Hickory <i>Carya spp.</i>
Dogwood <i>Cornus spp.</i>	Maple, red <i>Acer rubrum</i>

TURFGRASSES AND GRASSES FOR SEED PRODUCTION

■ PREPLANT AND RENOVATION ■

When applied as directed for "Noncrop Uses", under conditions described, this product controls most existing vegetation prior to the planting or renovation of either turfgrasses or grass seed production areas.

For specific rates of application and instructions for control of various annual and perennial weeds, and woody brush and trees, see the "Weeds Controlled" section of this label.

For maximum control of existing vegetation, delay planting to determine if any regrowth from escaped underground plant parts occurs. Where repeat treatments are necessary, sufficient regrowth must be attained prior to application. For warm-season grasses, such as bermudagrass, summer or fall application provide best control. DO NOT DISTURB SOIL OR UNDERGROUND PLANT PARTS BEFORE TREATMENT. Tillage or renovation techniques such as vertical mowing, coring or slicing should be delayed for 7 days after application to allow proper translocation into underground plant parts.

TURFGRASSES

Where existing vegetation is growing in a field or unmowed situation, apply this product to actively growing weeds at the stages of growth given in the "Weeds Controlled" section of this label.

Where existing vegetation is growing under mowed turfgrass management, apply this product after omitting at least one regular mowing to allow sufficient growth for good interception of the spray.

Desirable turfgrasses may be planted following the above procedures.

GRASSES FOR SEED PRODUCTION

Apply this product to actively growing weeds at the stages of growth given in the "Weeds Controlled" section of this label prior to planting or renovation of turf or forage grass areas grown for seed production.

DO NOT feed or graze treated areas within 8 weeks after application.

■ ANNUAL WEED CONTROL IN DORMANT BERMUDAGRASS AND BAHIAGRASS TURF ■

When applied as directed for "Noncrop Uses", this product will provide control or suppression of many winter annual weeds and tall fescue for effective release of dormant bermudagrass and bahiagrass turf. Refer to the rate table for Roundup alone under the "Release of Bermudagrass or Bahiagrass" section of this label for recommended rates and volumes on the species to be suppressed or controlled. Treat only when turf is dormant and prior to spring greenup. Spot treatments or broadcast applications of the product in excess of 16 ounces per acre may result in injury or delayed greenup in highly maintained turfgrass areas: i.e., golf courses, lawns, etc.

DO NOT APPLY TANK MIXTURES of Roundup plus Oust in highly maintained turfgrass areas.

RELEASE OF BERMUDAGRASS OR BAHIAGRASS

NOTE: Use only in areas where bermudagrass or bahiagrass are desirable ground covers and where some temporary injury or discoloration can be tolerated. Use Roundup plus Oust tank mixtures only on railroads, highways, utility plant sites, or other right-of-way areas.

When applied as directed for "Noncrop Uses", this product will provide control or suppression of many winter annual weeds and tall fescue for effective release of dormant bermudagrass or bahiagrass. This product may be tank-mixed with Oust as recommended for residual control. Make applications to dormant bermudagrass or bahiagrass. Roundup plus Oust tank mixture may delay greenup. **To avoid delays in greenup and minimize injury, do not add more than 1 ounce per acre of Oust on bermudagrass or more than ½ ounce per acre on bahiagrass, or treat when these grasses are in a semi-dormant condition.**

For best results on winter annuals, treat when plants are in an early growth stage (below 6 inches in height) after most have germinated. For best results on tall fescue, treat when fescue is in or beyond the 4 to 6-leaf stage.

WEEDS CONTROLLED

Rate recommendations for control or suppression of winter annuals and tall fescue are listed below:

Apply the recommended rates of this product alone or as a tank mixture in 10 to 25 gallons of water, plus 0.5 to 1 percent nonionic surfactant by total spray volume per acre.

For the best recommendation for the mixture of weeds within your geographic areas, contact your Monsanto sales representative.

WEEDS CONTROLLED OR SUPPRESSED WITH ROUNDUP® ALONE*

NOTE: C = Control
S = Suppression

WEED SPECIES	ROUNDUP® OZ/ACRE					
	8	12	16	24	32	64
Barley, little <i>Hordeum pusillum</i>	S	C	C	C	C	C
Bedstraw, catchweed <i>Galium aparine</i>	S	C	C	C	C	C
Bluegrass, annual <i>Poa annua</i>	S	C	C	C	C	C
Chervil <i>Chaerophyllum tainturieri</i>	S	C	C	C	C	C
Chickweed, common <i>Stellaria media</i>	S	C	C	C	C	C
Clover, crimson <i>Trifolium incarnatum</i>	•	S	S	C	C	C
Clover, large hop <i>Trifolium campestre</i>	•	S	S	C	C	C
Fescue, tall <i>Festuca arundinaceae</i>	•	•	•	•	S	S
Geranium, Carolina <i>Geranium carolinianum</i>	•	•	S	S	C	C

Henbit <i>Lamium amplexicaule</i>	•	S	C	C	C	C
Ryegrass, Italian <i>Lolium multiflorum</i>	•	•	S	C	C	C
Speedwell, corn <i>Veronica arvensis</i>	S	C	C	C	C	C
Vetch, common <i>Vicia sativa</i>	•	•	S	C	C	C

*These rates apply only to sites where an established competitive turf is present.

WEEDS CONTROLLED OR SUPPRESSED WITH ROUNDUP® PLUS OUST*

NOTE: C = Control
S = Suppression

WEED SPECIES	ROUNDUP® + OUST (OZ/ACRE)							
	ROUNDUP 8 OUST	8 ¼	12 ¼	12 ½	16 ¼	16 ½	12 1	16 1
Barley, little <i>Hordeum pusillum</i>	C	C	C	C	C	C	C	C
Bedstraw, catchweed <i>Galium aparine</i>	C	C	C	C	C	C	C	C
Bluegrass, annual <i>Poa annua</i>	S	C	C	C	C	C	C	C
Chervil <i>Chaerophyllum tainturieri</i>	C	C	C	C	C	C	C	C
Chickweed, common <i>Stellaria media</i>	S	C	C	C	C	C	C	C
Clover, crimson <i>Trifolium incarnatum</i>	S	S	S	S	C	C	C	C
Clover, large hop <i>Trifolium campestre</i>	•	•	S	S	S	C	C	C
Fescue, tall <i>Festuca arundinaceae</i>	•	•	•	•	•	S	S	S
Geranium, Carolina <i>Geranium carolinianum</i>	•	S	S	C	C	C	C	C
Henbit <i>Lamium amplexicaule</i>	•	S	C	C	C	C	C	C
Ryegrass, Italian <i>Lolium multiflorum</i>	•	S	S	C	C	C	C	C
Speedwell, corn <i>Veronica arvensis</i>	S	C	C	C	C	C	C	C
Vetch, common <i>Vicia sativa</i>	C	C	C	C	C	C	C	C

*These rates or mixtures of rates apply only to sites where an established competitive turf is present.

RELEASE OF ACTIVELY GROWING BERMUDAGRASS

When applied as directed, this product will aid in the release of bermudagrass by providing control of annual species listed in the "Weeds Controlled" section of this and the Oust label, and suppression or partial control of certain perennial weeds.

For control or suppression of those annual species listed on this label, use 1 to 3 pints of this product as a broadcast spray in 10 to 25 gallons of spray solution per acre. Use the lower rate when treating annual weeds below 6 inches in height (or length of runner in annual vines). Use higher rate as size of plants increases or as they approach flower or seedhead formation.

Use the higher rate of this product for partial control of the following perennial species. Use the lower rates for suppression of growth. For best results, see the "Weeds Controlled" section of this label for proper stage of growth.

Bahiagrass <i>Paspalum notatum</i>	Johnsongrass** <i>Sorghum halepense</i>
Bluestem, silver <i>Andropogon saccharoides</i>	Trumpetcreeper* <i>Campsis radicans</i>
Fescue, tall <i>Festuca arundinaceae</i>	Vaseygrass <i>Paspalum urvillei</i>

*Suppression at higher rates only.

**Control at the higher rates.

This product may be tank-mixed with Oust. If tank-mixed, use no more than 1 to 2 pints per acre of Roundup herbicide with 1 to 2 ounces of Oust per acre.

Use the lower rates of both mixtures to control annual weeds below 6 inches in height (or runner length in annual vines) that are listed in the "Weeds Controlled" section of this booklet and the Oust label. Use the higher rates as annual weeds increase in size and approach the flower or seedhead stages.

Use the higher rates of this product to provide partial control of the following perennial weeds. Use the lower rates for suppression of growth.

Bahiagrass <i>Paspalum notatum</i>	Johnsongrass* <i>Sorghum halepense</i>
Bluestem, silver <i>Andropogon saccharoides</i>	Poorjoe** <i>Diodia teres</i>
Broomsedge <i>Andropogon virginicus</i>	Trumpetcreeper* <i>Campsis radicans</i>
Dock, curly <i>Rumex crispus</i>	Vaseygrass <i>Paspalum urvillei</i>
Dogfennel <i>Eupatorium capilliflorum</i>	Vervain, blue <i>Verbena hastata</i>

Fescue, tall
Festuca arundinaceae

*Suppression at higher rates only.

**Control at the higher rates.

Use only on well-established bermudagrass. Bermudagrass injury may result from the treatment but regrowth will occur under moist conditions. Repeat applications in the same season are not recommended, since severe injury may result.

Read and carefully observe the cautionary statements and all other information appearing on the labels of all herbicides used.

BAHIAGRASS SEEDHEAD AND VEGETATIVE SUPPRESSION

When applied as directed in the indicated noncrop areas (roadsides, airports, golf course roughs, and plant sites) this product will provide significant inhibition of seed-head emergence and will suppress vegetative growth for a period of approximately 45 days with single applications and approximately 120 days with sequential applications.

Apply Roundup herbicide 1 to 2 weeks after full greenup of bahiagrass or after the bahiagrass has been mowed to a uniform height of 3 to 4 inches. Applications must be made prior to seedhead emergence. Apply 6 fluid ounces per acre of this product plus 0.5 to 1 percent non-

ionic surfactant by total spray volume in 10 to 25 gallons of water per acre.

Sequential applications of this product plus 0.5 to 1 percent nonionic surfactant by total spray volume may be made at approximately 45 day intervals to extend the period of seedhead and vegetative growth suppression. For continued seedhead suppression, sequential applications must be made prior to seedhead emergence. Apply no more than 2 sequential applications per year. As a first sequential application, apply 4 fluid ounces of this product per acre plus nonionic surfactant. A second sequential application of 2 to 4 fluid ounces per acre plus nonionic surfactant may be made approximately 45 days after the last application.

A tank mixture of Roundup plus Oust may be applied only on roadsides for seedhead inhibition and vegetative suppression. Apply 6 fluid ounces per acre of this product plus 0.25 ounce per acre of Oust, plus 0.5 to 1 percent nonionic surfactant by total spray volume 1 to 2 weeks following an initial spring mowing. When using Roundup plus Oust for suppression of bahiagrass, make only one application per year.

CROPPING SYSTEMS

See "General Information" and "Mixing, Additives and Application Instructions" sections of this label for essential product performance information.

See the following "Cropping Systems" sections for specific recommended uses.

EXTREME CARE MUST BE EXERCISED TO AVOID CONTACT OF SPRAY WITH FOLIAGE, GREEN STEMS OR FRUIT OF DESIRABLE CROPS, PLANTS, TREES OR OTHER DESIRABLE VEGETATION SINCE SEVERE DAMAGE OR DESTRUCTION MAY RESULT.

Repeat treatments may be necessary to control weeds regenerating from underground parts or seed. Except as otherwise specified on this label, repeat treatments must be made before the crop emerges in accordance with the instructions of this label.

Except as otherwise specified in a crop section of this label, the combined total of all treatments must not exceed 8 quarts per acre of this product per year.

Do not plant subsequent crops other than those on the label for 30 days following application.

For other cropping systems, except following spot treatment in forage grasses and legumes, do not harvest or feed treated crops for 8 weeks after application. Allow 14 days following spot treatment or selective equipment use before grazing domestic livestock or harvesting forage grasses and legumes.

When applied as directed for "Cropping Systems", under the conditions described, this product controls annual and perennial weeds listed on this label, prior to the emergence of direct seeded crops or prior to transplanting of crops listed on this label.

ALFALFA*	KALE
ARTICHOKE,	LENTILS
JERUSALEM	LETTUCE
ASPARAGUS*	LOGANBERRY
BARLEY*	MELONS***
BEANS (All)	MUSTARD GREENS
BEET GREENS	OATS*
BEETS (Red, Sugar)	OKRA
BLACKBERRY	OLALLIEBERRY

BLUEBERRY	ONION
BOYSENBERRY	PEANUTS
BROCCOLI	PEAS (All)
CABBAGE	PEPPER***
CARROT	PINEAPPLE****
CAULIFLOWER	POTATO (Irish, Sweet)
CELERY	PUMPKIN***
CHICORY	RADISH
CORN (All)*	RASPBERRY (Black, Red)
COTTON*	RICE**
CRANBERRY	RUTABAGA
CUCUMBER***	SORGHUM (Milo)
CURRENT	SOYBEANS*
DEWBERRY	SPINACH
EGGPLANT***	SQUASH*** (Summer, Winter)
ELDERBERRY	TOMATO***
FORAGE GRASSES*	TOMATOES***†
FORAGE LEGUMES*	TURNIPS
GARLIC***	WATERMELON***
GOOSEBERRY	WATERCRESS***
GOURDS***	WHEAT*
HORSERADISH	
HUCKLEBERRY	

*Spot treatments may be applied in these crops.

**Do not treat rice fields or levees when the fields contain flood water.

***Apply only prior to planting. Allow at least 3 days between application and planting.

****Do not feed or graze treated pineapple forage following application.

† Use is restricted to direct seeded crops only.

Spot Treatment (Only those crops with "*" can be spot treated.)—Applications in growing crops must be made prior to heading of small grains and milo, initial pod set in soybeans, silking of corn, boll opening on cotton.

For forage grasses and forage legumes see "Spot Treatment" in the "Pastures" section of "Cropping Systems" in this label.

For dilution and rates of application using boom or hand-held equipment, see "Mixing, Additives and Application Instructions" and "Weeds Controlled" sections of this label.

NOTE: FOR FORAGE GRASSES AND FORAGE LEGUMES, NO MORE THAN ONE-TENTH OF ANY ACRE SHOULD BE TREATED AT ONE TIME. FOR ALL OTHER CROPS, DO NOT TREAT MORE THAN 10 PERCENT OF THE TOTAL FIELD AREA TO BE HARVESTED.

THE CROP RECEIVING SPRAY IN TREATED AREA WILL BE KILLED. TAKE CARE TO AVOID DRIFT OR SPRAY OUTSIDE TARGET AREA FOR THE SAME REASON.

Selective Equipment—This product may be applied through recirculating sprayers, shielded applicators, or wiper applicators in cotton and soybeans. Shielded and wiper applicators may also be used in tree crops and grapes. Wiper applicators may be used in rutabagas, forage grasses and forage legumes, including pasture sites and sorghum milo.

See the "Selective Equipment" part of the "Application Equipment and Techniques" section of this label for information on proper use and calibration of this equipment.

Allow at least the following time intervals between application and harvest:

Cotton, Soybeans 7 days

Apples, Avocado, Cherry, Citrus,	
Grapes, Pear,	
Rutabagas	14 days
Stone Fruit	17 days
Nut Crops	21 days
Sorghum (milo)*	40 days

*Do not use roller applicators. Do not feed or graze treated milo fodder. Do not ensile treated vegetation.

ASPARAGUS

When applied as directed for "Cropping Systems" under the conditions described, this product controls weeds listed on this label in asparagus.

For specific rates of applications and instructions for control of various annual and perennial weeds, see the "Weeds Controlled" section of this label.

Prior to Crop Emergence—Apply this product prior to crop emergence for the control of emerged labeled annual and perennial weeds. **DO NOT APPLY WITHIN A WEEK BEFORE THE FIRST SPEARS EMERGE.**

Spot Treatment—Apply this product immediately after cutting, but prior to the emergence of new spears. Do not treat more than 10 percent of the total field area to be harvested. Do not harvest within 5 days of treatment.

Postharvest—Apply this product after the last harvest and all spears have been removed. If spears are allowed to regrow, delay application until ferns have developed. Delayed treatments should be applied as directed or shielded spray in order to avoid contact of the spray with ferns, stems or spears. Direct contact of the spray with the asparagus may result in serious crop injury.

NOTE: Select and use recommended types of spray equipment for postemergence postharvest applications. A directed spray is any application where the spray pattern is aligned in such a way as to avoid direct contact of the spray with the crop. A shielded spray is any application where a physical barrier is positioned and maintained between the spray and the crop to prevent contact of spray with the crop.

BERRIES AND SMALL FRUITS

For cranberries, apply after fruit set and no later than 30 days before harvest.

For other berries, apply as a preplant broadcast application, or as a directed spray or wiper application post-planting.

Wiper applicators may be used in cranberries in accordance with instructions in this section.

See "General Information" and "Mixing, Additives and Application Instructions" sections of this label for essential product performance information.

See the "Selective Equipment" part of the "Application Equipment and Techniques" section of this label for information on recommended use and calibration of this equipment.

For Wick or other Wiper Applicators—Mix 1 gallon of this product in 4 gallons of water to prepare a 20 percent solution. Apply the solution to emerged weeds. Apply after cranberry fruit set and no later than 30 days before harvest.

In severe infestations, reduce equipment ground speed to insure that adequate amounts of this product are wiped on the weeds. A second treatment in the opposite direction may be beneficial.

Do not permit herbicide solution to contact desirable vegetation, including green shoots, canes, or foliage.

FALLOW AND REDUCED TILLAGE SYSTEMS

FOR AERIAL APPLICATION IN CALIFORNIA, REFER TO SUPPLEMENTAL LABEL.

Use this product in fallow and reduced tillage systems for control of annual weeds prior to emergence of crops listed in this label. Refer to the "Weeds Controlled" section of this label for specific rates and instructions. This product may be applied using ground or aerial spray equipment. See the "Application Equipment and Techniques" section of this label for instructions.

- **TANK MIXTURES** ■
- **ROUNDUP® plus BANVEL** ■
plus NONIONIC SURFACTANT
- **ROUNDUP plus 2,4-D AMINE** ■
plus NONIONIC SURFACTANT
- **ROUNDUP plus GOAL™** ■
plus NONIONIC SURFACTANT

DO NOT APPLY BANVEL, OR 2,4-D AMINE TANK MIXTURES BY AIR IN CALIFORNIA.

The additions of Banvel in a mixture with this product may provide short-term residual control of selected weed species. Some crop injury may occur if Banvel is applied within 45 days of planting. Refer to the Banvel and 2,4-D labels for cropping restrictions and other use instructions.

Roundup® plus Goal Tank Mixtures

This product alone or in tank mixtures with Goal plus 0.5 to 1 percent nonionic surfactant by total spray volume will provide control of those weeds listed below.

Make applications when weeds are actively growing and at the recommended stages of growth. Avoid spraying when weeds are subject to moisture stress, when dust is on the foliage or when straw canopy covers the weeds.

ROUNDUP® 12 oz/acre		ROUNDUP 16 oz/acre	
Wheat	18"	Annual grasses at	
Barley	12"	left plus:	
Bluegrass,		Ryegrass,	
annual	6"	annual	6"
Barnyardgrass	6"	Chickweed	6"
Rye	6"	Groundsel	6"
		Marestail	6"
		Rocket, London	6"
		Shepherdspurse	6"
		Crabgrass	12"
		Johnsongrass,	
		seedling	12"
		Lambsquarters	12"
		Oats, wild	12"
		Pigweed, redroot	12"
		Mustards	12"

ROUNDUP 12 oz/acre	ROUNDUP 16 oz/acre
+	+
GOAL** 2 to 4 oz/acre	GOAL** 2 to 4 oz/acre
Annual grasses above	Annual weeds above
plus:	plus
Cheeseweed, common 3"	Cheeseweed, common 6"

Chickweed	3"	Groundsel	6"
Groundsel	3"	Chickweed	12"
Rocket, London	6"	Rocket, London	12"
Shepherdspurse	6"	Shepherdspurse	12"

*Maximum height or length in inches.

**Use the higher rate when weeds approach maximum recommended height or stands are dense.

These recommended tank mixtures may be applied using ground or aerial spray equipment. Refer to the "Weeds Controlled" section of this label for specific rates and instructions.

™Glean is a trademark of E. I. du Pont de Nemours and Company

™Goal is a trademark of Rohm and Haas Company.

AID TO TILLAGE

This product, when used in conjunction with preplant tillage practices, will provide control of downy brome, cheat, volunteer wheat, tansy mustard and foxtail. Apply 8 fluid ounces of this product plus 0.5 to 1 percent nonionic surfactant by total spray volume in 3 to 10 gallons of water per acre. Make applications when weeds are actively growing and before they are 6 inches in height. Application must be followed by conventional tillage practices no later than 15 days after treatment and before regrowth occurs. Allow at least 1 day after application before tillage. Tank mixtures with residual herbicides may result in reduced performance.

PASTURES

Apply this product prior to planting forage grasses and legumes.

Pasture or Hay Crop Renovation—When applied as a broadcast spray this product controls the annual and perennial weeds listed in this label prior to planting forage grasses or legumes. Remove domestic livestock before application and wait 8 weeks after application before grazing or harvesting.

Spot Treatment—When applied as a spot treatment as recommended, this product controls annual and perennial weeds listed in this label which are growing in pastures, forage grasses and forage legumes composed of bahiagrass, bermudagrass, bluegrass, brome, fescue, orchardgrass, ryegrass, timothy, wheatgrass, alfalfa or clover.

Wiper Application—When applied as directed this product controls or suppresses the weeds listed under "Wiper Applicators" in the "Selective Equipment" section of this label. For spot treatment and wiper application, apply in areas where the movement of domestic livestock can be controlled. No more than one-tenth of any acre should be treated at one time. Further applications may be made in the same area at 30 day intervals. Remove domestic livestock before application and wait 14 days after application before grazing livestock or harvesting.

SUGARCANE

When applied as directed for "Cropping Systems", under the condition described, this product controls those emerged annual and perennial weeds listed on this label

growing in or around sugarcane or in fields to be planted to sugarcane. This product will also control undesirable sugarcane.

NOTE: Where repeat treatments are necessary, do not exceed a total of 10 6 quarts of this product per acre per year. Do not apply to vegetation in or around ditches, canals or ponds containing water to be used for irrigation.

Broadcast Treatment—Apply this product in 10 to 40 gallons of water per acre on emerged weeds growing in fields to be planted to sugarcane.

For specific rates of application and instructions for control of various annual and perennial weeds, see the "Weeds Controlled" section of this label.

For removal of last stubble or ratoon cane, apply 4 to 5 quarts of this product in 10 to 40 gallons of water per acre to new growth having at least 7 or more new leaves. Allow 7 or more days after application before tillage.

Spot Treatment in or Around Sugarcane Fields—For dilution and rates of application using hand-held equipment, see "Mixing, Additives and Application Instructions" and "Weeds Controlled" sections of this label.

For control of volunteer or diseased sugarcane, make a 1 percent solution of this product in water and spray to wet the foliage of vegetation to be controlled.

NOTE: When spraying volunteer or diseased sugarcane, the plants should have at least 7 new leaves.

Avoid spray contact with healthy cane plants since severe damage or destruction may result.

Do not feed or graze treated sugarcane forage following application.

MINIMUM TILLAGE SYSTEMS ■ Tank Mixtures ■ CORN AND SOYBEANS

When applied as recommended under the conditions described, these tank mixtures control many emerged weeds, and give preemergence control of many annual weeds when corn or soybeans will be planted directly into a cover crop, established sod, or in previous crop residues.

Refer to specific product labels for crop rotation restrictions and cautionary statements of all products used in these tank mixtures. For mixing instructions, see the "Mixing, Additives and Application Instructions" section of this label.

CORN

- **ROUNDUP® plus LASSO®** ■
- **ROUNDUP plus LASSO plus ATRAZINE** ■
- **ROUNDUP plus LASSO plus BLADEx™** ■
- **ROUNDUP plus LASSO plus SIMAZINE** ■
- **ROUNDUP plus ATRAZINE plus SIMAZINE** ■

SOYBEANS

- **ROUNDUP® plus LASSO®** ■
- **ROUNDUP plus LASSO plus LINURON** ■
- **ROUNDUP plus LASSO plus LEXONE™** ■
- **ROUNDUP plus LASSO plus SENCOR™** ■

Apply these tank mixtures in 10 to 40 gallons of water per acre after planting or during planting in such manner that the planter does not disturb the treated soil. Do not apply these mixtures after crop emergence.

REDUCED CONTROL MAY RESULT IF THIS PRODUCT IS USED IN TANK MIXTURES CONTAINING FLUID FERTILIZERS

CONTROL OF EMERGED WEEDS

Annual Weeds—Apply to actively growing grasses and broadleaf weeds. Use 1 quart of Roundup herbicide per acre in these tank mixtures if weeds are less than 6 inches tall. If weeds are over 6 inches tall, apply 1.5 quarts of this product per acre. For emerged annual weeds controlled, see the "Weeds Controlled" section of this label.

Perennial Weeds—At normal application rates in minimum tillage systems, perennial weeds may not be at the proper stage of growth for control. See the "General Information" section of this label for the proper stage of growth for perennial weeds.

Use of 2 to 4 quarts of Roundup herbicide per acre in these tank mixtures, under these conditions provides top kill and reduces competition from many emerged perennial grass and broadleaf weeds. For emerged perennial weeds controlled, see the "Weeds Controlled" section of this label.

To obtain the desired stage of growth, it may be necessary to apply Roundup herbicide alone in the late summer or fall and then follow with a label-approved, seedling weed control program at planting.

NOTE: When using these tank mixtures, do not exceed 4 quarts of Roundup herbicide per acre.

USE OF THESE TANK MIXTURES FOR BERMUDAGRASS OR JOHNSONGRASS CONTROL IN MINIMUM TILLAGE SYSTEMS IS NOT RECOMMENDED. For bermudagrass control, follow the instructions under "Control of Perennial Weeds" section of this label and then use a label-approved, seedling weed-control program in a minimum tillage or conventional tillage system. For johnsongrass control, follow the instructions under "Control of Perennial Weeds" section of the label, and then use a label-approved seedling weed-control program with conventional tillage.

The following are labeled ranges for the recommended preemergence herbicides:

PRODUCT	RATES/ACRE	
	(QUARTS)	(POUNDS)
Lasso	2 to 4	•
Atrazine 4L	1 to 2	•
Atrazine 80WP	•	1.25 to 2.3
Atrazine 90DF	•	1.1 to 2
Bladex 4L	1 to 2.2	•
Bladex 80WP	•	1.25 to 2.75
Simazine 4L	1 to 2.2	•
Simazine 80WP	•	1.25 to 2.75
Linuron 4L	0.5 to 1.5	•
Linuron 50WP	•	1 to 3
Lexone 4L or Sencor 4F	0.25 to 0.75	•
Lexone or Sencor 50 WP	•	0.5 to 1.55
Lexone or Sencor 75DF	•	0.33 to 1

Read and carefully observe the label claims, cautionary statements, rates and all other information on the labels of all products. Use according to the most restrictive label directions for each product in the mixture.

*Lasso is a registered trademark of Monsanto Company.

™Bladex and ™Lexone are trademarks of F. I. du Pont de Nemours and Company.

™Sencor is a trademark of the parent company of Farbentabrike Bayer GmbH, Leverkusen.

PREHARVEST APPLICATIONS

When applied as directed under the conditions described, this product controls annual and perennial weeds listed on this label prior to the harvest of COTTON.

Weed Control—For specific rates of application and instructions for control of various annual and perennial weeds, see the "Weeds Controlled" section of this label.

Broadcast Applications—This product may be applied using either aerial or ground spray equipment. For ground applications with broadcast equipment, apply this product in 10 to 40 gallons of water per acre. For aerial applications, apply this product in 3 to 15 gallons of water per acre.

To control johnsongrass using multiple nozzle-directed spray equipment, apply 1 quart of this product plus 0.5 to 1 percent nonionic surfactant by total spray volume in 10 to 20 gallons of water per acre. Ensure complete coverage.

For partial control of field bindweed, apply one quart of this product plus 0.5 to 1 percent nonionic surfactant by total spray volume in 3 to 40 gallons of water per acre. Apply when bindweed is actively growing and 12 inches or greater in length. Reduced performance may result if bindweed is under drought stress.

Tank Mixtures

Roundup® plus Def™ 6 Roundup plus Folex™

When applied as recommended under the conditions described, these tank mixtures control annual and perennial weeds listed on this label prior to the harvest of cotton. For application guidelines, precautions and defoliant rates, refer to the supplemental label for cotton harvest aid.

Timing of Application—Apply this product or these tank mixtures for preharvest weed control after 60 percent of the cotton bolls have opened.

NOTE: DO NOT APPLY TO CROPS GROWN FOR SEED.

Allow a minimum of 7 days between application and harvest.

Do not feed or graze treated cottonseed forage or hay following preharvest applications.

™Def is a trademark of Mobay Chemical Corporation.

™Folex is a trademark of Rhone-Poulenc, Inc.

TREE AND VINE CROPS

This product is recommended for weed control in established groves, vineyards, or orchards, or for site preparation prior to transplanting crops listed in this section. Applications may be made with boom equipment, CDA, shielded sprayers, hand-held and high-volume wands, lances, or orchard guns, or with wiper applicator equipment, except as directed in this section. See the "Application Equipment and Techniques" section of this label for specific information on use of equipment.

When applying Roundup alone, refer to the "Weeds Controlled" section for recommended rates to be used.

NOTE

Repeat treatments may be necessary to control weeds originating from underground parts of untreated weeds or from seeds. This product does not provide residual weed control. For subsequent weed control, follow a program using residual herbicides or use repeated applications of this product. Do not apply more than 10.6 quarts of this product per acre per year.

EXTREME CARE MUST BE EXERCISED TO AVOID CONTACT OF HERBICIDE SOLUTION, SPRAY DRIFT, OR MIST WITH FOLIAGE OR GREEN BARK OF TRUNK, BRANCHES, SUCKERS, FRUIT, OR OTHER PARTS OF TREES OR VINES. CONTACT OF THIS PRODUCT WITH OTHER THAN MATURED BROWN BARK CAN RESULT IN SERIOUS CROP DAMAGE.

AVOID PAINTING OUT STUMPS WITH THIS PRODUCT AS INJURY RESULTING FROM ROOT GRAFTING MAY OCCUR IN ADJACENT TREES.

Reduced control may result when applications are made to annual or perennial weeds that have been mowed, grazed or cut and have not been allowed to regrow to the recommended stage for treatment.

For specific rates of applications and instructions, see the "Weeds Controlled" section of this label.

TANK MIXTURES TREE AND VINE CROPS

When applied as a tank mixture, this product provides control of the emerged annual weeds and partial control of the emerged perennial weeds listed in this label. The following residual herbicides will provide preemergence control of those weeds listed in the individual product labels.

■	ROUNDUP® plus GOAL™ 1.6E	■
■	ROUNDUP plus KARMEX™ WP	■
■	ROUNDUP plus KROVAR™ I	■
■	ROUNDUP plus KROVAR™ II	■
■	ROUNDUP plus SIMAZINE, CALIBER™ 90	■
■	ROUNDUP plus SIMAZINE 4L	■
■	ROUNDUP plus SIMAZINE 80W	■
■	ROUNDUP plus SOLICAM™ 80WP	■
■	ROUNDUP plus SURFLAN™ AS	■
■	ROUNDUP plus SURFLAN 75W	■
■	ROUNDUP plus SIMAZINE (80W, or 4L, or CALIBER 90) plus SURFLAN (AS or 75W)	■
■	ROUNDUP plus GOAL (1.6E) plus SURFLAN (AS or 75W)	■
■	ROUNDUP plus GOAL (1.6E) plus SIMAZINE (80W, or 4L, or CALIBER 90)*	■
■	ROUNDUP plus GOAL (1.6E) plus SURFLAN (AS or 75W) plus simazine (80W, 4L, or Caliber 90)	■

*See the Roundup plus Goal plus simazine tank mixture section below for specific use instructions.

When tank-mixing with residual herbicides, add an agriculturally approved nonionic surfactant.

Do not apply these tank mixtures in Puerto Rico.

CONTROL OF EMERGED WEEDS

Annual Weeds—Apply 1 quart per acre of this product in these tank mixtures, when weeds are less than 12 inches tall. For weeds greater than 12 inches tall, apply 1.5 quarts per acre.

Perennial Weeds—For partial control of perennial weeds using these tank mixtures, apply 2 to 5 quarts per acre of this product. Follow the recommendations in the "Weeds Controlled" section of this label for stage of growth and rate of application for specific perennial weeds.

PREEMERGENCE WEED CONTROL

The following are the labeled rates for the recommended residual herbicides:

PRODUCT	RATE/ACRE
Goal 1.6E	1.25 to 5 qts.
Karmex WP	2 to 8 lbs.
Krovar I	2 to 8 lbs.
Krovar II	2 to 8 lbs.
Simazine, Caliber 90	1.1 to 10.6 lbs.
Simazine, 80W	1¼ to 12 lbs.
Simazine 4L	2 to 9.6 qts.
Solicam 80WP	2½ to 5 lbs.
Surflan AS	2 to 4 qts.
Surflan 75W	2½ to 5½ lbs.

NOTE: These residual herbicides may provide post-emergence activity on certain annual weed species.

Refer to the individual product labels for specific crops, rates, geographical restrictions and precautionary statements.

Read and carefully observe the label claims, cautionary statements, rates and all other information on the labels of all products.

For specific rates of application and instructions see the "Weeds Controlled" section of this label.

ROUNDUP® Plus GOAL

Roundup alone and Roundup plus Goal tank mixtures will control or suppress annual weeds listed below.

Apply the recommended rates of Roundup or Roundup plus Goal tank mixtures plus 0.5 to 1 percent nonionic surfactant by spray volume in 3 to 10 gallons of water per acre. Apply when weeds are actively growing and less than 6 inches in height. If weeds are under drought stress, irrigate prior to application.

RECOMMENDED RATES AND WEEDS CONTROLLED

WEEDS SPECIES	C = Control			S = Suppression	
	Roundup rate (fl oz/acre)			Roundup + Goal (fl oz/acre)	
	8	12	16	16 + 4 to 16	
Bluegrass, annual	C	C	C		C
Barley	C	C	C		C
Cheeseweed, common (3")	S	S	S		C
Rocket, London	S	S	C		C
Shepherdspurse	S	S	C		C
Chickweed	S	C	C		C
Fleabane, flaxleaf	S	C	C		C
Red Maids	S	C	C		C

16 + 4 to 16

Barnyardgrass	S	C	C	C
Cheeseweed, common (3-6")	S	S	S	C
Crabgrass	S	S	C	C
Groundsel, common	S	S	C	C
Junglerice	S	S	C	C
Lambsquarters	S	S	C	C
Marestail	S	S	C	C
Pigweed, redroot	S	S	C	C
Ryegrass, common	S	S	C	C
Sowthistle, annual	S	S	C	C
Purslane, common	S	S	C	C
Nettle, stinging	S	S	C	C
Filaree	S	S	S	S

ROUNDUP® plus GOAL plus SIMAZINE (California only)

Roundup may be tank-mixed with Goal plus simazine for broad-spectrum postemergence and preemergence control. Refer to the following table for approved crops and rate ranges for each product in this tank mix. Refer to the individual product labels for weeds controlled, geographical restrictions, precautionary statements and specific use rates.

CROP	RATE RANGES*		
	ROUNDUP® (quarts)	GOAL + 1.6E (quarts)	SIMAZINE + 80W** (pounds)
Grapes	1 to 1.5	1.25 to 5	2.5 to 5
Almond	1 to 1.5	1.25 to 5	1.25 to 2.5

Use equivalent rate of Caliber 90 or simazine 4L.

*Rate dependent on weeds present.

**Rate dependent on soil type and weeds present.

ROUNDUP® plus GOAL plus SIMAZINE/SURFLAN

This product plus Goal, applied alone or as a three-way or four-way with simazine and/or Surflan, will provide postemergence control of those weeds listed below when applied as recommended.

Refer to individual product labels for preemergence rates, weeds controlled, precautionary statements and other important information.

Apply these tank mixtures in 3 to 40 gallons of water. Add 0.5 to 1 percent nonionic surfactant by total spray volume to the spray solution.

WEEDS CONTROLLED

Weed Species	Maximum Height (inches)	Roundup® + Goal (quarts/acre)
Barley, wild	4	0.5 to 1 + 0.5 to 5
Bluegrass, annual	4	0.5 to 1 + 0.5 to 5
Cheeseweed, common	4	0.5 to 1 + 0.5 to 5
Chickweed, common	4	0.5 to 1 + 0.5 to 5

Flaxleaf, fleabane	4	0.5 to 1 + 0.5 to 5
Groundsel, common	4	0.5 to 1 + 0.5 to 5
Marestail	4	0.5 to 1 + 0.5 to 5
Pineappleweed	4	0.5 to 1 + 0.5 to 5
Rocket, London	4	0.5 to 1 + 0.5 to 5
Shepherdspurse	4	0.5 to 1 + 0.5 to 5
Sowthistle, annual	4	0.5 to 1 + 0.5 to 5
Cheeseweed, common	12	1 to 1.5 + 1 to 5
Nettle, stinging	12	1 to 1.5 + 1 to 5
Filaree	12	1 to 1.5 + 1 to 5

™Goal is a trademark of Rohm and Haas Company.

™Solicam is a trademark of Sandoz, Inc.

PERENNIAL GRASS SUPPRESSION ORCHARD FLOORS

When applied as directed this product will suppress vegetative growth as indicated below.

Bahiagrass

This product will provide significant inhibition of seed-head emergence and will suppress vegetative growth for a period of approximately 45 days with a single application and approximately 120 days with sequential applications. Apply this product 1 to 2 weeks after full green-up or after mowing to a uniform height of 3 to 4 inches. Applications must be made prior to seedhead emergence. Apply 6 fluid ounces of this product plus 0.5 to 1 percent nonionic surfactant by total spray volume in 10 to 25 gallons of water per acre.

Sequential applications of this product plus nonionic surfactant may be made at approximately 45-day intervals to extend the period of seedhead and vegetative growth suppression. For continued seedhead suppression, sequential applications must be made prior to seedhead emergence. Apply no more than 2 sequential applications per year. As a first sequential application, apply 4 fluid ounces of this product plus nonionic surfactant. A second sequential application of 2 to 4 fluid ounces may be made approximately 45 days after the last application.

Bermudagrass

For burndown, apply 1 to 2 quarts of this product plus 0.5 to 1 percent nonionic surfactant by total spray volume in 3 to 20 gallons of water per acre. Use 1 quart of this product in 3 to 20 gallons of water per acre east of the Rocky Mountains. Use 1 to 2 quarts of this product in 3 to 10 gallons of water per acre west of the Rocky Mountains. Use this treatment only if reduction of the bermudagrass stand can be tolerated. When burndown is required prior to harvest, allow at least 21 days to ensure sufficient time for burndown to occur.

Suppression only (east of the Rocky Mountains)—Apply 6 to 16 fluid ounces plus 0.5 to 1 percent nonionic surfactant by total spray volume in 3 to 20 gallons of water per acre no sooner than 1 to 2 weeks after full green-up. Mowing prior to application may occur provided a minimum height of 3 inches is maintained. Rates of 6 to 10 fluid ounces plus nonionic surfactant should be used in shaded conditions or where a lesser degree of suppression is desired. Sequential applications may be made when regrowth occurs and bermudagrass injury and stand reduction can be tolerated.

Suppression only (west of the Rocky Mountains) Apply 16 fluid ounces of this product plus 0.5 to 1 percent non ionic surfactant by total spray volume in 3 to 10 gallons of water per acre up to 6 inches in height and no sooner than 1 to 2 weeks after full green-up. Mowing prior to application may occur provided a minimum height of 3 inches is maintained. Sequential applications may be made when regrowth occurs and bermudagrass injury and stand reduction can be tolerated.

Cool Season Grass Covers

For suppression of tall fescue, fine fescue, orchardgrass and quackgrass, apply 8 fluid ounces of this product plus 0.5 to 1 percent nonionic surfactant by total spray volume in 10 to 20 gallons of water per acre. For best suppression, add ammonium sulfate to the spray solution at a rate of 2 percent by weight or 17 pounds per 100 gallons of spray solution.

For suppression of Kentucky bluegrass covers, apply 6 fluid ounces of this product plus nonionic surfactant. Do not add ammonium sulfate.

For best results, mow cool-season grass covers in the spring to even their height and apply the recommended rate of this product 3 to 4 days after mowing. Avoid treating cool season grass covers under poor growing conditions, such as drought stress (drip irrigation), disease or insect damage.

LOW VOLUME APPLICATION (FLORIDA AND TEXAS)

For burndown or control of listed perennial weeds, apply the recommended rates of this product plus 0.5 to 1 percent nonionic surfactant by total spray volume in 3 to 20 gallons of water per acre. Where weed foliage is dense, use 10 to 20 gallons of water per acre.

Apply when weeds are actively growing and at the growth stages listed in the "Perennial Weeds Controlled" section of this label. If perennial weeds are mowed, allow weeds to regrow to the recommended stage of growth.

S = Suppression B = Burndown
PC = Partial control C = Control

WEED SPECIES	ROUNDUP RATE PER ACRE			
	1 qt	2 qts	3 qts	5 qts
Bermudagrass	B	•	PC	C
Guineagrass				
Texas and Florida Ridge	B	C	C	C
Florida Flatwoods	•	B	C	C
Paragrass	B	C	C	C
Torpedograss	S	•	PC	C

TREE CROPS

Citrus*: citron, grapefruit, kumquat, lemon, lime, orange, tangelo, tangerine.

Nuts**: almond, filbert, macadamia, pecan, pistachio, walnut.

Pome Fruit*: apple, pear.

Stone Fruit***: apricots, cherries, nectarines, olives, peaches, plums/prunes.

For cherries, any application equipment listed in this section may be used in all states.

For citron and olives, apply as a directed spray only.

Any application equipment listed in this section may be used in apricots, nectarines, peaches, and plums/prunes growing in Arizona, California, Colorado, Idaho, Kansas, Kentucky, New Jersey, North Dakota, Oklahoma, Oregon, Texas, Utah, and Washington, except for peaches grown in the states specified in the following paragraph. In all other states use wiper equipment only.

For PEACHES grown in Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, and Tennessee only, apply with a shielded boom sprayer or shielded wiper applicator which prevents any contact of this product with the foliage or bark of trees. Apply no later than 90 days after first bloom. Applications made after this time may result in severe damage.

Remove suckers and low hanging limbs at least 10 days prior to application. Avoid applications near trees with recent pruning wounds or other mechanical injury. Apply only near trees which have been planted in the orchard for 2 or more years. **EXTREME CARE MUST BE TAKEN TO ENSURE NO PART OF THE PEACH TREE IS CONTACTED.**

Tropical Fruit: acerola, avocado*, banana (plantains), coffee****, figs*, guava, mango*, papaya, tea. Allow minimum of 1 day between last application and harvest of guava and papaya. In coffee and banana, delay applications 3 months after transplanting to allow the new coffee or banana plant to become established.

NOTE:

*Allow a minimum of 14 days between last application and harvest.

**Allow a minimum of 21 days between last application and harvest of these crops.

***Allow a minimum of 17 days between last application and harvest.

****Allow a minimum of 28 days between last application and harvest.

VINE CROPS

Kiwi Fruit*

Grapes* Any variety of table, wine, or raisin grape may be treated with any equipment listed in this section.

In the northeast and Great Lakes regions, applications must be made prior to the end of bloom stage of grapes to avoid injury.

*Applications should not be made when green shoots, canes, or foliage are in the spray zone.

*Allow a minimum of 14 days between last application and harvest.

CALIFORNIA

Roundup® herbicide has been approved by the U.S. Environmental Protection Agency for the uses, crops and sites listed in this label and by California under label designation 1988-1. Approval of the items listed below is pending under the State of California registration requirements. With the exception of these items, this booklet contains the material approved by California in label 1988-1.

These use conditions, crops and sites may not be treated with this product in California until approval is received:

- Aerial application of Roundup plus Oust at the rate of 5 to 15 gallons of spray solution per acre for conifer release.
- Prior to planting or transplanting of strawberries.
- Lariat® tank mixtures.

EPA Reg. No. 524-308-AA

897.10-004.85/CG

This product has been approved for use in California except as stated otherwise on page 118.

In case of an emergency involving this product, Call Collect, day or night, (314) 694-4000.

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MONSANTO COMPANY
AGRICULTURAL PRODUCTS
ST. LOUIS, MISSOURI 63167 U.S.A.



DU PONT

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Ailly®

HERBICIDE



TRADEMARK

DRY FLOWABLE

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REGISTRATION CODE 0291-000

PACKAGE SIZE
8 - 8 OZ. CANISTERS/CARTON



ALLY®

HERBICIDE

DRY FLOWABLE

ACTIVE INGREDIENT

Metsulfuron Methyl

BY WEIGHT

Methyl 2-[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)-amino]carbonyl]-amino]sulfonyl]benzoate 60%

INERT INGREDIENTS 40%

TOTAL 100%

EPA Reg. No. 352-435

U.S. Pat. 4,383,113

KEEP OUT OF REACH OF CHILDREN

CAUTION

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

CAUTION! Harmful if absorbed through skin. Causes eye irritation. Avoid contact with skin, eyes or clothing. Avoid breathing dust or spray mist. Wash thoroughly after handling. Remove contaminated clothing and wash before reuse.

STATEMENT OF PRACTICAL TREATMENT

In case of contact with eyes, immediately flush with plenty of water.

If on skin, wash with plenty of soap and water. Get medical attention if irritation persists.

For medical emergencies involving this product, call toll-free 1-800-441-3637.

ENVIRONMENTAL HAZARDS

Do not apply directly to water or wetlands (swamps, bogs, marshes and potholes). Do not contaminate water when disposing of equipment washwaters.

IMPORTANT INFORMATION—(READ BEFORE USING)

Injury to or loss of desirable trees or vegetation may result from failure to observe the following: Do not apply, drain or flush equipment on or near desirable trees or other plants, or on areas where their roots may extend, or in locations where the chemical may be washed or moved into contact with their roots. Do not use on lawns, walks, driveways, tennis courts or similar areas. Prevent drift of spray to desirable plants. Do not contaminate any body of water, including irrigation water that may be used on other crops.

Carefully observe all sprayer cleanup instructions both prior to and after using this product, as spray tank residue may damage crops other than wheat, barley or grasses grown on Conservation Reserve Program (CRP) acres.

PESTICIDE HANDLING

- Calibrate sprayers only with clean water away from the well site.
- Make scheduled checks of spray equipment.
- Assure accurate measurement of pesticides by all operation employees.
- Mix only enough product for the job at hand.
- Avoid over-filling of spray tank.
- Do not discharge excess material on the soil at a single spot in the field/grove or mixing/loading station.
- Dilute and agitate excess solution and apply at labeled rates/uses.
- Avoid storage of pesticides near well sites.
- When triple rinsing the pesticide container, be sure to add the rinsate to the spray mix.

CEREAL AND CRP USE INSTRUCTIONS

GENERAL INFORMATION

Du Pont "Ally" Herbicide is recommended for use on wheat and barley in CO, ID, KS, MN, MT, NE, NM, ND, OK, SD, TX, UT and WY. Do not use this product in the following counties of Colorado: Alamosa, Conejos, Costilla, Rio Grande and Saguache.

"Ally" is recommended for use on land primarily dedicated to the production of wheat (including durum) and barley. Rotation options are provided for certain other crops such as oats, proso millet, dryland grain sorghum, dryland corn, soybeans, flax, sunflower, safflower, alfalfa, hay and dry beans. In areas having a short growing season, prolonged periods of low soil temperature and low annual rainfall, "Ally" can remain in the soil for 34 months or more and cause severe injury to certain crops other than those listed in the "Crop Rotation Guidelines" section of the label. Read and follow the "Crop Rotation Guidelines" section for the specific rotation intervals for all following crops. Before using "Ally", carefully consider your crop rotation plans and options. For maximum rotational flexibility, do not treat all your wheat or barley acres with "Ally".

"Ally" is a 60% active ingredient herbicide formulated as a dry flowable granule to be mixed in water and applied for use as a uniform broadcast spray for selective weed control in wheat (including durum), barley and in grasses on acreage enrolled in the CRP. "Ally" may be applied by air or with ground spray equipment. It is noncorrosive, nonflammable, nonvolatile and does not freeze.

For application to wheat or barley, "Ally" should be applied postemergence to actively growing broadleaf weeds. Herbicide combinations may be required for certain weeds as indicated under "Tank Mixtures for Resistant Weed Management" or "Tank Mixtures" in the "Weed Control in Wheat and Barley" section.

"Ally" rapidly inhibits growth of susceptible weeds; however, typical symptoms (discoloration) of dying weeds may not be noticeable for 1 to 3 weeks after application depending on growing conditions and weed susceptibility. Warm, moist conditions following treatment enhance the activity of "Ally", while cold, dry conditions delay activity. Weeds hardened-off by cold weather or drought stress may not be fully controlled or suppressed and regrowth may occur. Snow or rainfall received within 4 hours after application can reduce the level of weed control.

Degree of control and duration of effect depend on: Weed spectrum and density; weed size and variability; growing conditions prior to, at and following time of application; amount of precipitation, and spray coverage. With adequate rainfall for soil activation, short-term residual control of the more sensitive species may be obtained for a few weeks after application.

INFORMATION ON RESISTANT WEEDS

Naturally-occurring weed biotypes* resistant to this product are known to exist. To delay the development of resistant biotypes, spray "Ally" only in tank mixtures with broadleaf herbicides having a different mode of action**, such as: 2,4-D, Banvel[1]/Banvel SGF, Buctril[2], Bronate[2], Curtail[3], Curtail M[3], MCPA, Du Pont Karmex® DF Herbicide or Du Pont "Lexone" DF Herbicide—as specified in the "Tank Mixtures for Resistant Weed Management" section of this label.

Note: Because these resistant biotypes are known to be present, accurate record keeping of pesticides applied to individual fields is advisable in order to obtain information on the spread and dispersal of the resistant biotypes.

*Biotypes are naturally-occurring individuals of the species which have a slightly different genetic makeup. Resistant biotypes may look exactly the same as susceptible biotypes. Herbicide-resistant biotypes are able to survive a use rate several times higher than needed to control susceptible biotypes. These resistant biotypes will not be controlled by "Ally" Herbicide or other herbicides that have the same mode of action such as Amber[4], Du Pont Express® Herbicide, Glean® FC Herbicide and Harmony® Extra Herbicide.

**Mode of action is the chemical interaction that interrupts a biological process necessary for plant growth and development.

READ AND FOLLOW ALL APPROPRIATE SECTIONS OF LABEL INCLUDING PRECAUTIONS BEFORE USING THIS PRODUCT.

GRAZING

"Ally" has no grazing restrictions.

DIRECTIONS FOR USE

It is a violation of federal law to use this product in a manner inconsistent with its labeling.

Do not apply this product through any type of irrigation system.

"Ally" should be used only in accordance with recommendations on this label or in separate published Du Pont recommendations available through local dealers.

Du Pont will not be responsible for losses or damages resulting from the use of this product in any manner not specifically recommended by Du Pont. User assumes all risks associated with such nonrecommended use.

MAXIMUM USE RATE AND SOIL pH LIMITATION

In CO, ID, Western KS and Western NE (west of Highway 183), MN, MT, NM, ND, OK Panhandle, TX Panhandle, SD, UT and WY, the maximum crop use rate is 1/10 oz/A in a 22-month period.

In Central KS, Central NE, Central OK and North Central TX, the maximum crop use rate is 1/10 oz/A in a 10-month period.

Do not use "Ally" on soils with a pH greater than 7.9 as the extended soil residual activity could adversely affect crop rotation options beyond normal intervals and, under certain conditions, cause injury to wheat and barley.

NOTE: Prior to using "Ally", take soil samples at 0-4" depth and determine the soil pH. Soil pH is to be determined by laboratory analysis using the 1:1, soil to water suspension method on representative soil samples taken at 0-4" depth. Representative soil sampling requires the collection of soil samples from each distinct topographical area in a field, for example, hill-tops, hillsides, low areas. This means that several soil samples must be taken and analyzed separately in order to obtain a correct assessment of the soil pH variation in a given field. Consult local extension publications for additional information on recommended soil sampling procedures.

WEED CONTROL IN WHEAT AND BARLEY

For best weed control or weed suppression, apply "Ally" postemergence to weeds when environmental conditions favor active growth of broadleaf weeds and when crop canopy will allow thorough coverage of target weeds. Unless otherwise directed, always include a surfactant.

For best weed control performance, use "Ally" in a tank mix with 2,4-D (ester formulations perform best). This tank mix works best where weed biotypes resistant to "Ally", "Amber", "Glean" FC, "Harmony" Extra or "Express" Herbicides are not suspected or known to occur.

Where resistant weed biotypes, such as kochia and Russian thistle, are suspected (land which has had 2 or more previous applications of "Glean" FC or is immediately adjacent to land where "Glean" FC has been used 2 or more times) or known to be present, select the most effective tank mix partner labeled for the control of kochia and/or Russian thistle and adjust the rate so that it alone will control the resistant biotype(s).

Note: If resistant biotypes are present, degree of control will depend solely on the effectiveness of the tank mix partner.

Determine crop rotation plans according to "Crop Rotation Guidelines" section of this label.

TIMING OF CROP APPLICATION

For winter wheat and winter barley, apply "Ally" (1/10 oz/A) postemergence after crop is in the 2-leaf stage—but before the boot stage. Do not apply during boot stage or early heading, as crop injury may occur.

For spring barley and spring wheat (except durum or Wampum variety), apply "Ally" (1/10 oz/A) postemergence after crop is in the 2-leaf stage—but before the boot stage. Do not apply during boot stage or early heading, as crop injury may occur.

For durum spring wheat and Wampum variety of spring wheat, apply "Ally" (1/10 oz/A) postemergence only after crop is tillering (refer to 2,4-D manufacturers' labels)—but before the boot stage and only in combination with 2,4-D. Do not apply during boot stage or early heading, as crop injury may occur.

Irrigated Cereals (wheat/barley): On land dedicated to cereal production, which includes supplemental irrigation, delay first posttreatment irrigation for at least 3 days after treatment. The first posttreatment irrigation should not exceed 1". Apply "Ally" after crop tillering has begun. Do not apply "Ally" to stressed plants.

WEEDS CONTROLLED WITH TANK MIXES OF "ALLY" PLUS OTHER BROADLEAF HERBICIDES

1/10 Ounce Per Acre

(80 acres treated per 8 ounce canister)

Unless otherwise directed, treat when weeds are less than 4" tall or in diameter and are actively growing. See "Specific Weed Problems", "Tank Mixtures For Resistant Weed Management" and "Tank Mixtures" sections for additional information.

Blue/purple mustard*
Bur buttercup (testiculate)
Coast fiddleneck (tarweed)
Common chickweed
Common purslane
Conical catchfly
Cowcockle

False chamomile
Field pennycress (fanweed)
Filaree
Flixweed*
Groundsel (common)
Henbit
+Kochia
Lambsquarters (common, slimleaf)
Mayweed chamomile

Miners lettuce
Pigweed (redroot, smooth, tumble)
Plains cereopsis
+Prickly lettuce
+Russian thistle
Shepherd's-purse
Smallseed tansellax
Smartweed (green, ladythumb, pale)
Snow speedwell
Tansymustard*
Treacle mustard
Tumble/Jim Hiff mustard
Volunteer sunflower
Waterpod
Wild mustard

*See "Specific Weed Problems".

+Naturally-occurring resistant biotypes of these weeds are known to occur in the Central Plains and in Southern ID and UT. "Ally" will not control these resistant biotypes. See "Tank Mixtures For Resistant Weed Management" section of label for additional information.

WEEDS SUPPRESSED¹ WITH TANK MIXES OF "ALLY" PLUS OTHER BROADLEAF HERBICIDES

Annual Ryegrass*
Canada thistle*
Common sunflower*
Corn gromwell*

Knotweed (prostrate)*
Sowthistle (annual)*
Wild buckwheat*

¹Weed suppression is a visual reduction in weed competition (reduced population and/or vigor) as compared to an untreated area. Degree of suppression will vary with rate used, size of weeds and environmental conditions following treatment.

*See "Specific Weed Problems".

SPECIFIC WEED PROBLEMS

Annual Ryegrass: (OK, TX) To obtain the best results, a sequential treatment of "Glean" FC in the fall followed by "Ally" in the spring is recommended. Apply "Glean" FC at 1/2 oz/A preemergence to ryegrass. 1/2 to 1" of rainfall is needed to move "Glean" FC into the weed root zone prior to ryegrass emergence. Remove grazing cattle during wet (muddy) field conditions to avoid disturbing the herbicide barrier. Immediately after completion of wheat grazing, apply "Ally" with a surfactant or with a liquid nitrogen fertilizer topdressing application. For fields not grazed, apply the sequential application of "Ally" as soon as ryegrass starts to grow after winter dormancy. Do not add a surfactant to liquid nitrogen fertilizer plus "Ally" combinations. In mixing "Ally" with liquid fertilizer, slurry "Ally" in water, then thoroughly mix the slurry into the fertilizer. Run a tank mix compatibility test before mixing "Ally" in fertilizer solution. DO NOT use with fertilizers having a pH of 3.0 or less, as rapid product degradation can occur. The addition of 2,4-D is not recommended for annual ryegrass suppression.

Blue Mustard, Flixweed and Tansymustard: (ID, MN, MT, ND, SD, UT and WY) For best results, apply "Ally" tank mixtures with 2,4-D or MCPA postemergence to mustards, but before bloom.

Canada Thistle and Sowthistle: Apply either "Ally" plus surfactant or "Ally" plus 2,4-D or MCPA in the spring after majority of thistles have emerged and are small (rosette stage to 6" elongating stems) and actively growing. An application will inhibit the ability of emerged thistles to compete with the crop.

Sunflower (common/volunteer): Apply either "Ally" plus surfactant or "Ally" plus 2,4-D or MCPA after the majority of sunflowers have emerged, are 2" to 4" tall and are actively growing. Thorough coverage is important. Use minimum spray volumes of 3 gal by air and 5 gal by ground.

Corn Gromwell and Prostrate Knotweed: Apply "Ally" plus surfactant when weeds are actively growing, no larger than 2" tall and crop canopy will allow thorough coverage. The addition of 2,4-D or MCPA may or may not improve the results.

Wild Buckwheat: For best results, apply "Ally" plus 2,4-D or "Ally" plus MCPA when plants have no more than 3 true leaves (not counting the cotyledons). If plants are not actively growing, delay treatment until environmental conditions favoring active weed growth are present. Thorough coverage is important.

TANK MIXTURES FOR RESISTANT WEED MANAGEMENT

Central KS, Central NE, Central OK and North Central TX:

- o Apply "Ally" only as a tank mix treatment with 2,4-D (amine or ester), MCPA (amine or ester) or "Banvel"/"Banvel" SGF. Use 1/10 oz/A of "Ally" plus either 1/4 to 1/2 lb active ingredient 2,4-D/MCPA (ester formulations of 2,4-D or MCPA have provided best results) or 1/16 to 1/8 lb active ingredient "Banvel"/"Banvel" SGF. Surfactant may be added at 1 to 2 pt per 100 gal of spray volume; however, the addition of surfactant may increase the chance for crop injury. Apply "Ally" plus MCPA from 3-5 leaf, but prior to boot stage. Apply "Ally" plus 2,4-D after tillering (refer to 2,4-D manufacturer's label), but prior to boot stage. Refer to "Banvel"/"Banvel" SGF labels for application timing of "Ally" tank mix.
- o If resistant weed biotypes, such as kochia and Russian thistle, are suspected (land which has had 2 or more previous applications of "Glean" FC or is immediately adjacent to land where "Glean" FC has been used 2 or more times) or known to be present, consider using another herbicide treatment or adjust the use rate of the "Ally" tank mix partner labeled for the control of kochia and/or Russian thistle so that it alone will control the resistant biotypes.
- o "Ally" tank mixes can be applied annually in this area.
- o Do not apply "Ally" during fallow unless specified otherwise.
- o Read and follow all use instructions, label rates, weed control claims, warnings and precautions for the companion herbicide(s).

Southern ID, MN, MT, ND, SD, UT, and Northern WY:

- o Where resistant weeds are not suspected (land not previously treated more than once with "Glean" FC and not immediately adjacent to other land where "Glean" FC has been used 2 or more times), apply "Ally" as a tank mix treatment with 2,4-D (amine or ester), MCPA (amine or ester) or "Banvel"/"Banvel" SGF. Use 1/10 oz/A of "Ally" plus either 1/4 to 1/2 lb active ingredient 2,4-D/ MCPA (ester formulations of 2,4-D/MCPA have provided best results) or 1/16 to 1/8 lb active ingredient "Banvel"/"Banvel" SGF. Surfactant may be added at 1 to 2 pt per 100 gal of spray volume; however, the addition of surfactant may increase the chance for crop injury. Apply "Ally" plus MCPA from 3-5 leaf, but prior to boot stage. Apply "Ally" plus 2,4-D after tillering (refer to 2,4-D manufacturer's label),

but prior to boot stage. Refer to "Banvel"/"Banvel" SGF labels for application timing of "Ally" tank mix.

- o If resistant weed biotypes, such as kochia and Russian thistle, are suspected (land which has had 2 or more previous applications of "Glean" FC or is immediately adjacent to land where "Glean" FC has been used 2 or more times) or known to be present, consider using another herbicide treatment or adjust the use rate of the "Ally" tank mix partner labeled for the control of kochia and/or Russian thistle so that it alone will control the resistant biotypes.
- o Do not apply "Ally" during fallow.
- o Do not apply "Ally" more often than once in a 22-month period for a given field.
- o Do not apply "Ally" for 22 months before or after a "Glean" FC treatment.
- o Read and follow all use instructions, label rates, weed control claims, warnings and precautions for the companion herbicide(s).

CO, Western KS and Western NE (west of Highway 183), Eastern NM, OK Panhandle, TX Panhandle and Southeastern WY:

- o Where resistant weeds are not suspected (land not previously treated more than once with "Glean" FC and not immediately adjacent to other land where "Glean" FC has been used 2 or more times), apply "Ally" as a tank mix treatment with 2,4-D (amine or ester), MCPA (amine or ester) or "Banvel"/"Banvel" SGF. Use 1/10 oz/A of "Ally" plus either 1/4 to 1/2 lb active ingredient 2,4-D/ MCPA (ester formulations of 2,4-D/MCPA have provided best results) or 1/16 to 1/8 lb active ingredient "Banvel"/"Banvel" SGF. Surfactant may be added at 1 to 2 pt per 100 gal of spray volume; however, the addition of surfactant may increase the chance for crop injury. Apply "Ally" plus MCPA from 3-5 leaf, but prior to boot stage. Apply "Ally" plus 2,4-D after tillering (refer to 2,4-D manufacturer's label), but prior to boot stage. Refer to "Banvel"/"Banvel" SGF labels for application timing of "Ally" tank mix.
- o If resistant weed biotypes, such as kochia and Russian thistle, are suspected (land which has had 2 or more previous applications of "Glean" FC or is immediately adjacent to land where "Glean" FC has been used 2 or more times) or known to be present, consider using another herbicide treatment or adjust the use rate of the "Ally" tank mix partner labeled for the control of kochia and/or Russian thistle so that it alone will control the resistant biotypes.
- o Do not apply "Ally" more often than once in a 22-month period on a given field.
- o Read and follow all use instructions, label rates, weed control claims, warnings and precautions for the companion herbicide(s).

TANK MIXTURES

"Ally" must be in suspension before adding companion herbicide(s) or spray adjuvant(s).

For tank mixtures with other broadleaf weed herbicides, see "Tank Mixtures For Resistant Weed Management" section of this label.

Other Tank Mixtures: "Ally" will not control wild oats or other grasses. If broadleaf weeds plus wild oats and/or grasses are present, apply "Ally" with a suitable registered product either as a tank mix or sequential treat-

ment. When tank mixing "Ally" and Assert[5] herbicide, ALWAYS include another broadleaf herbicide with a different mode of action, for example: 2,4-D ester, MCPA ester, "Bronate" or "Buctril".

Read and follow all use instructions, label rates, weed control claims, warnings and precautions for the companion herbicide(s).

DO NOT tank mix with "Hoelon" 3EC[6] as wild oat or green foxtail control may be reduced.

"Ally" may be tank mixed with insecticides registered for use on cereal grains. However, under certain conditions (drought stress, crop in 2-4 leaf stage), tank mixes of "Ally" plus organophosphate insecticides (such as methyl or ethyl parathion, Di-Syston[7], etc.) may produce temporary crop yellowing or, in severe cases, crop injury. The potential for crop injury is greatest when there are fluctuations in day/night temperatures just prior to or soon after application. Limit first use to a small area before treating large acreage.

Do not apply "Ally" within 60 days of crop emergence where an organophosphate insecticide (such as "Di-Syston") has been applied as an in-furrow treatment, as crop injury may result.

DO NOT USE "ALLY" PLUS MALATHION AS CROP INJURY MAY RESULT.

SPRAY PREPARATION, ADDITIVES, PRODUCT MEASUREMENTS, SURFACTANT AND LIQUID FERTILIZER

Spray Preparation: Pour the proper amount of "Ally" into the necessary volume of water in the spray tank with the agitator running. Continuous agitation is required for a uniform suspension and application. "Ally" must be added first to the spray tank followed by any other tank mix chemicals and surfactant.

Use spray preparation of "Ally" within 24 hours or product degradation may occur. If spray preparation is left standing without agitation, thoroughly agitate before reusing.

Additives: Do not use with spray additives that lower the pH of the spray solution below pH 3.0, as rapid product degradation can occur.

Product Measurement: The "Ally" volumetric measuring cylinder is to be used as a guide, since the degree of accuracy varies by plus or minus 7.5%. For more precise measurement, use scales calibrated in ounces.

Surfactant: Unless directed otherwise, use a surfactant of at least 80% active ingredient and add it as the last ingredient at the rate of 1 to 2 quarts per 100 gal. of spray volume on winter wheat or 1/2 to 1 quart on spring wheat, spring or winter barley, durum spring wheat and Wampum variety of spring wheat. Antifoaming agents may be needed. DO NOT use liquid fertilizer in addition to or as a substitute for a surfactant.

Liquid Fertilizer: Slurry "Ally" in water; then thoroughly mix the slurry into the liquid fertilizer. DO NOT add a surfactant. Run a tank mix compatibility test before mixing "Ally" in fertilizer solution. DO NOT use with fertilizers having a pH of 3.0 or less as rapid product degradation can occur. If 2,4-D is included in "Ally" and liquid fertilizer mixture, the ester formulations are generally more compatible.

NOTE: Since the presence of tank-mix partners can interfere with the dispersion of "Ally", when multiple tank loads of the same tank mix are being prepared, preslurry "Ally" in a dedicated container of clean water prior to adding to the tank.

WEED CONTROL FOR THE CONSERVATION RESERVE PROGRAM (CRP)

"Ally" is registered for CRP use in CO, Southern ID, KS, MT, NE, NM, ND, OK, SD, TX, UT and WY. Consult "Ally" supplemental label for CRP use instructions.

WEED CONTROL IN REDUCED TILLAGE FALLOW

DO NOT USE "ALLY" IN FALLOW UNLESS SPECIFIED OTHERWISE.

EQUIPMENT-SPRAY VOLUMES

Read before using: It is important that spray equipment is cleaned and free of existing pesticide deposits before using "Ally". Follow the cleanup procedures specified on the label of the product previously sprayed. If no cleanup is provided, follow this cleanup procedure for all application equipment.

1. Thoroughly rinse sprayer, tanks, boom, and hoses with clean water. Loosen and physically remove any visible deposits.
2. Partially fill the tank with water and add ammonia (1 gallon of 3% (household) ammonia per 100-gallons of tank volume) or a tank cleaner* (follow individual label instructions for amount of tank cleaner to use). Complete filling the tank and flush the cleaning solution through the boom and hoses. Let stand for 15 minutes with agitation/recirculation and then drain the tank after flushing the hoses, boom and nozzles.
3. Thoroughly rinse sprayer, tanks, boom, and hoses with clean water.
4. Follow label directions of the product previously sprayed for rinsate disposal.

*See listing of Du Pont approved tank cleaners under "Sprayer Cleanup" portion of the label.

NOTE: A steam cleaning of aerial spray tanks is recommended to dislodge any visible pesticide deposits.

Spray Equipment: Apply using properly calibrated air or ground equipment. Select a spray volume and delivery system that will insure thorough coverage and a uniform spray pattern. Avoid overlapping, and shut off spray booms while starting, turning, slowing or stopping, or injury to the crop or following crops may result.

Do not use equipment and/or spray volumes that will cause spray to drift onto nontarget sites. Do not make applications during weather conditions which cause spray to drift onto nontarget sites. For additional information, refer to "Caution-Avoid Spray Drift" section of label.

Refer to specific manufacturer's recommendations for additional information on GPA, pressure, speed, nozzle types and arrangements, nozzle heights above the target canopy, etc., for respective application equipment.

Do not apply this product through any type of irrigation system.

Agitation: Continuous agitation is required to keep "Ally" in suspension.

Ground Application: For optimum spray distribution and thorough coverage, use flat fan or low volume flood nozzles. For flat fan nozzles, do not use less than 3-gal spray volume per acre (GPA).

For flood nozzles on 30-inch nozzle spacings, use not less than 10 GPA and no larger than TK10 or equivalent and not less than 30 psi. On 40-inch nozzle spacings, use not less than 13 GPA. 100% overlapping of nozzle spray pattern is recommended for 30 and 40-inch spacings.

With "Raindrop"[8] nozzles, do not use less than 30 GPA and insure for 100% overlap of nozzle spray patterns.

Use 50-mesh screens or larger.

Aerial Application: Use nozzle types and arrangements that will provide for optimum spray distribution and maximum coverage at 1 to 5 GPA. Do not apply during inversion conditions, when winds are gusty, or when other conditions will favor poor coverage and/or off-target spray movement.

Caution - Avoid Spray Drift

Follow these practices to minimize drift.

Do not allow spray from either ground or aerial equipment to drift onto adjacent crops or land, as even small amounts can injure susceptible plants. When spraying near adjacent, sensitive crops or plants, do everything possible to reduce spray drift. This includes:

- o Stop spraying if wind speed becomes excessive. DO NOT SPRAY IF WIND SPEED IS 10 MPH OR GREATER. Spray drift can occur at wind speeds less than 10 MPH. If sensitive crops or plants are downwind, extreme caution must be used even in relatively low wind conditions! DO NOT SPRAY IF WINDS ARE GUSTY.
- o High temperatures, drought and low relative humidity increase the possibility of harmful spray drift. EXTREME CAUTION MUST BE USED WHEN THESE CONDITIONS ARE PRESENT AND SENSITIVE CROPS OR PLANTS ARE NEARBY, REGARDLESS OF WIND SPEED.
- o Do not apply when a temperature inversion exists. An inversion is characterized by low air movement and an increase in air temperature with an increase in altitude. In humid regions, a fog or mist may form. An inversion may be detected by producing a smoke column and checking for a layering effect. Smoke-producing devices on aircraft are recommended. If not sure whether inversion conditions are present, consult with local weather services before making an application.
- o Drift from aerial or ground equipment may be further reduced by:
 1. Using large droplet size sprays to minimize drift. DO NOT APPLY WITH HOLLOW-CONE INSECTICIDE NOZZLES ON GROUND EQUIPMENT. Do not use nozzles that produce small droplets, such as Sprayloil[9] or airblast-type nozzles. Nozzles should be oriented at an angle between straight down and straight back for ground applications.

For aerial applications, orient nozzles straight back along the wind-stream using straight stream orifices (such as disk with no swirl plate). If using flood-type nozzles on aircraft, orient them so spray is produced in direction of the airstream. Use the lowest number of nozzles practical with the largest orifice size per nozzle to obtain minimum of 1 GPA. Application height should not exceed 1/2 length of wing span, to minimize drift potential. Boom length must not exceed 2/3 of wing span.

2. Increasing volume of spray mix per acre (for example, minimum 5 GPA by air, 10 GPA by ground) by using higher flow-rate nozzles.

3. Reducing pressure (PSI) DO NOT EXCEED 40 PSI when applying "Ally". (Vehicle speed must also be reduced to maintain spray mix volume per acre). Consult manufacturer's catalogs for details on correct calibration.
4. Apply as close to target plants as possible while still maintaining a good spray pattern.

NOTE: Do not allow spray to drift onto adjacent crops, or onto agricultural land scheduled to be planted to crops other than wheat, as injury to the crop may occur. Extreme care must be taken to prevent drift onto susceptible nontarget plants or nontarget land

CROP ROTATION GUIDELINES

The crop rotation intervals specified in this section of the label must be followed unless a LRBSM bioassay indicates a shorter planting interval. See "Bioassay" section of label for details.

Crop rotation plans are determined by the crop to be planted and a minimum rotation interval. Minimum rotation interval is the time from the last application of "Ally" to the anticipated date of planting. For maximum rotational flexibility, do not use "Ally" on all your wheat or barley. Do not use on soils with a pH greater than 7.9.

Wherever "Ally" is used on land previously treated with "Glean" FC, read the rotational guidelines on both labels and follow the one with the longest interval stated for your situation.

These crops can be planted on nonirrigated land following the use of "Ally" at 1/10 oz/A:

CROP TO BE PLANTED

Prior to planting a rotational crop, determine the soil pH. Soil pH is to be determined by laboratory analysis using the 1:1, soil to water suspension method on representative soil samples taken at 0-4" depth. Representative soil sampling requires the collection of soil samples from each distinct topographical area in a field, for example, hilltops, hillsides, low areas. This means that several soil samples must be taken and analyzed separately in order to obtain a correct assessment of the soil pH variation in a given field. Consult local extension publications for additional information on recommended soil sampling procedures.

Cumulative Precipitation equals the total amount of moisture received from the date of "Ally" application to the date of planting the rotational crop. Should accumulated precipitation not be sufficient to meet the indicated amounts or the soil pH is above 7.9, do not rotate to the indicated crops until the following growing season.

Winter and spring wheat

Area: all¹
Soil pH: 7.9 or less
Cumulative Precipitation (inches): none
Minimum Rotation Interval (months): 1

CRP grasses²

Area: all¹
Soil pH: 7.9 or less
Cumulative Precipitation (inches): none
Minimum Rotation Interval (months): 4

Durum wheat, barley, spring/winter oatsArea: all¹

Soil pH: 7.9 or less

Cumulative Precipitation (inches): none

Minimum Rotation Interval (months): 10

Grain sorghum, proso millet

Area: CO, KS, NE, NM, OK, TX, Southern WY

Soil pH: 7.9 or less

Cumulative Precipitation (inches): none

Minimum Rotation Interval (months): 10

Area: SD³

Soil pH: 7.9 or less

Cumulative Precipitation (inches): 13

Minimum Rotation Interval (months): 12

Area: MT, Northern WY

Soil pH: 7.9 or less

Cumulative Precipitation (inches): 22

Minimum Rotation Interval (months): 22

Area: ND (west of State Hwy 1)

Soil pH: 7.9 or less

Cumulative Precipitation (inches): 22

Minimum Rotation Interval (months): 22

Area: ND (east of State Hwy 1)

Soil pH: 7.9 or less

Cumulative Precipitation (inches): 34

Minimum Rotation Interval (months): 34

Field cornArea: Central KS⁴

Soil pH: 7.9 or less

Cumulative Precipitation (inches): 25

Minimum Rotation Interval (months): 14

Area: CO⁵, KS⁵, NE⁵, North Central TX⁹ Southern WY⁵

Soil pH: 7.5 or less

Cumulative Precipitation (inches): 15

Minimum Rotation Interval (months): 12

Area: CO⁵, KS⁵, NE⁵, TX Panhandle Southern WY⁵

Soil pH: 7.6 to 7.9

Cumulative Precipitation (inches): 22

Minimum Rotation Interval (months): 22

Area: SD⁶

Soil pH: 7.9 or less

Cumulative Precipitation (inches): 15

Minimum Rotation Interval (months): 22

Area: MT, Northern WY

Soil pH: 7.9 or less

Cumulative Precipitation (inches): 22

Minimum Rotation Interval (months): 22

Area: ND (west of State Hwy 1)

Soil pH: 7.9 or less

Cumulative Precipitation (inches): 22

Minimum Rotation Interval (months): 22

Area: ND (east of State Hwy 1)

Soil pH: 7.9 or less

Cumulative Precipitation (inches): 34

Minimum Rotation Interval (months): 34

SoybeansArea: Central KS⁷

Soil pH: 7.9 or less

Cumulative Precipitation (inches): 25

Minimum Rotation Interval (months): 14

Area: KS⁸, NE⁸

Soil pH: 7.5 or less

Cumulative Precipitation (inches): 22

Minimum Rotation Interval (months): 22

Area: KS⁸, NE⁸

Soil pH: 7.6 to 7.9

Cumulative Precipitation (inches): 33

Minimum Rotation Interval (months): 34

Cotton (dryland only)Area: OK (east of the Panhandle), North Central TX⁹

Soil pH: 7.9 or less

Cumulative Precipitation (inches): 25

Minimum Rotation Interval (months): 14

Area: OK Panhandle and TX Panhandle, Eastern NM

Soil pH: 7.9 or less

Cumulative Precipitation (inches): 30

Minimum Rotation Interval (months): 22

Alfalfa (hay only)

Area: MT

Soil pH: 7.5 or less

Cumulative Precipitation (inches): none

Minimum Rotation Interval (months): 22

Area: MT

Soil pH: 7.6 to 7.9

Cumulative Precipitation (inches): none

Minimum Rotation Interval (months): 34

Dry beans

Area: ND (west of State Hwy 1)

Soil pH: 7.9 or less

Cumulative Precipitation (inches): 22

Minimum Rotation Interval (months): 22

Area: ND (east of State Hwy 1)

Soil pH: 7.9 or less

Cumulative Precipitation (inches): 34

Minimum Rotation Interval (months): 34

Flax, Safflower, Sunflower

Area: CO, Southern ID, KS, MT, NE, NM, OK, SD, TX, UT, WY

Soil pH: 7.9 or less

Cumulative Precipitation (inches): None

Minimum Rotation Interval (months): 22

Area: ND (west of State Hwy 1)

Soil pH: 7.9 or less

Cumulative Precipitation (inches): 22

Minimum Rotation Interval (months): 22

Area: ND (east of State Hwy 1)
Soil pH: 7.9 or less
Cumulative Precipitation (inches): 34
Minimum Rotation Interval (months): 34

All other crops*

Area: all¹
Soil pH: 7.9 or less
Cumulative Precipitation (inches): 28
Minimum Rotation Interval (months): 34

* All other crops refers to any crop not listed above or to a crop listed above where a specific crop rotation interval is not given.

1 All — CO, Southern ID, KS, MT, NE, NM, ND, OK, SD, TX, UT, WY

2 CRP grasses —

Blue Grama
Bluestems - Big, Little, Plains, Sand, WW Spar
Buffalograss
Green Sprangletop
Indiangrass
Kleingrass
Lovegrasses - Atherstone, Sand, Weeping, Wilman
Orchardgrass
Sideoats Grama
Switchgrass - Blackwell
Wheatgrasses - Bluebunch, Crested, Intermediate, Pubescent,
Siberian, Slender, Streambank, Tall, Thickspike, Western
Wildrye grass - Russian

The planting of grass and legume mixtures is not recommended as injury to the legume may occur.

3 SD—Generally south of state Highway 212 and east of the Missouri River, and generally south of state Highway 34 and west of the Missouri River.

4 Central KS—Generally east of state Highway 183 and west of the Flint Hills.

5 CO—Generally north of I-70.

5 KS—Generally north of I-70 and west of state Highway 183.

5 NE—Generally west of state Highway 77 and east of the Panhandle.

5 WY—Counties of Goshen, Laramie, Platte.

6 SD—Generally east of the Missouri River and south of state Highway 14 and west of the Missouri River.

7 Central KS—Generally east of state Highway 183 and west of the Flint Hills.

8 KS—Generally north of I-70 and west of state Highway 183.

8 NE—Generally west of state Highway 77 and east of the Panhandle.

9 Counties of:

Archer	Dallas	Hill	Montague	Tarrant
Baylor	Delta	Hood	Morris	Throckmorton
Bell	Denton	Hopkins	Navarro	Titus
Bosque	Eastland	Hunt	Palo Pinto	Upshur
Bowie	Ellis	Jack	Parker	Van Zandt
Callahan	Falls	Johnson	Rains	Wilbarger
Camp	Fannin	Kaufman	Red River	Wichita
Cass	Foard	Knox	Robertson	Williamson
Clay	Franklin	Lamar	Rockwall	Wise
Collin	Grayson	Limestone	Shackelford	Wood
Cooke	Hardeman	McLennan	Somervell	Young
Coryell	Haskell	Milam	Stephens	

BIOASSAY

Du Pont LRBSM Bioassay Service

In the states of ID, MT, ND and SD the Du Pont LRBSM Bioassay Service is available through certain dealers and/or consultants. This service uses soil samples taken by Du Pont certified individuals for laboratory bioassay analysis. LRBSM results will serve as a crop rotation recommendation.

Check with your local Du Pont representative or call toll free 1-800-782-3557 for information regarding the LRBSM Bioassay Service.

PRECAUTIONS

In CO, ID, Western KS and Western NE (west of Highway 183), MN, NM, ND, OK Panhandle, TX Panhandle, SD, UT and WY, the maximum use rate is 1/10 oz/A in a 22-month period.

In Central KS, Central NE, Central OK and North central TX, the maximum use rate is 1/10 oz/A in a 10 month period.

Do not use on soils with pH greater than 7.9 (for example, highly calcareous soils) as extended soil residual activity could adversely affect minimum rotation intervals for all crops.

Wherever "Ally" is used on land previously treated with "Glean" FC, read the rotational guidelines on both labels and follow the one with the longest interval stated for your situation.

Wherever land has been or will be treated with "Ally," "Amber" and "Assert", plant only wheat or barley until a bioassay (see "Bioassay" section of label) demonstrates that other crops can be successfully grown. On land that is frequently rotated to crops other than wheat or barley, do not use "Ally" wherever "Assert" has been or will be used. The additive effect of soil residues from these treatments has not been determined and crop rotation guidelines and minimum rotation intervals are not known; injury to rotational crops may occur.

Do not apply to irrigated land where tailwater will be used to irrigate crops other than wheat and barley.

Do not apply to frozen ground where surface runoff may occur.

Do not apply to snow-covered ground.

Varieties of wheat and barley differ in their tolerance to herbicides. When using "Ally" for the first time on a particular variety, limit initial use to one 8 oz canister. If no symptoms of crop injury occur within 14 days after treatment, balance of acreage can be treated.

Do not apply "Ally" to wheat or barley that is stressed by severe weather conditions, drought, low fertility, water saturated soil, disease or insect damage, as crop injury may result. Severe winter stress, drought, disease or insect damage following application also may result in crop injury.

Under certain conditions such as heavy rainfall, prolonged cool weather (daily high temperatures less than 50 degrees F) or wide fluctuations in day/night temperatures just prior to or soon after treatment, temporary discoloration and/or crop injury may occur. Risk of injury is greatest when crop is in the 2-5 leaf stage.

Tank mixtures of "Ally" and organophosphate insecticides (such as methyl or ethyl parathion or "Di-Syston", etc.) may cause temporary discoloration or

crop injury. The potential for crop injury is greatest when there are wide fluctuations in day/night temperatures just prior to or soon after treatment.

The combined treatment effects of "Ally" postemergence preceded by preemergence wild oat herbicides may cause crop injury to spring wheat when crop stress (soil crusting, planting too deep, prolonged cold weather or drought) causes poor seedling vigor.

To prevent cold weather-related crop injury, avoid making applications during winter months when weather conditions are unpredictable and can be severe.

Do not apply to wheat or barley undersown with legumes or grasses, as injury to the forage may result.

To reduce the potential for movement of treated soil due to wind erosion, do not apply to powdery dry or light sandy soils until they have been stabilized by rainfall, trashy mulch, reduced tillage or other cultural practices. Injury to adjacent crops may occur when treated soil is blown onto land used to produce crops other than cereal grains.

For ground applications applied to weeds when dry, dusty field conditions exist, control of weeds in wheel track areas may be reduced. The addition of 2,4-D or MCPA should improve weed control under these conditions.

Tank mix applications of "Ally" plus "Assert" may cause temporary crop discoloration/stunting or injury when heavy rainfall occurs shortly after application.

Preplant or preemergence applications of 2,4-D or herbicides containing 2,4-D made within two weeks of planting spring cereals may cause crop injury when used in conjunction with early postemergence applications of "Ally". Under these conditions, delay "Ally" treatment until crop tillering has begun.

With any chemical, follow labeling instruction and warnings carefully.

SPRAYER CLEANUP

AT THE END OF THE DAY

It is recommended that during periods when multiple loads of "Ally" herbicide will be applied, at the end of each day of spraying rinse the interior of the tank with fresh water, then partially fill the tank and flush the boom and hoses. This will prevent the buildup of dried pesticide deposits which can accumulate in the application equipment.

AFTER SPRAYING "ALLY" AND BEFORE SPRAYING CROPS OTHER THAN WHEAT, BARLEY OR CRP GRASSES

To avoid subsequent injury to desirable crops, thoroughly clean all mixing and spray equipment immediately following applications of "Ally" as follows:

1. Drain tank; thoroughly rinse spray tanks, boom, and hoses with clean water. Loosen and physically remove any visible deposits.
2. Fill the tank with clean water and one gallon of household ammonia* (contains 3% active) for every 100 gallons of water. Flush the hoses, boom and nozzles with the cleaning solution. Then add more water to completely fill the tank. Circulate the cleaning solution through the tank and hoses for at least 15 minutes. Again flush the hoses, boom and nozzles with the cleaning solution and then drain the tank.

3. Remove the nozzles and screens and clean separately in a bucket containing cleaning agent and water.
4. Repeat step 2.
5. Rinse the tank, boom and hoses with clean water.
6. The rinsate may be disposed of on site or at an approved waste disposal facility.

*Equivalent amounts of an alternate strength ammonia solution or a Du Pont approved cleaner (listed below) can be used in the cleanout procedure. Carefully read and follow the individual cleaner instructions.

Du Pont approved cleaners:

- Protank Cleaner—Manufactured for Genex/Land O'Lakes Agronomy Co.
- Chem-Tank Cleaner & Neutralizer—Manufactured by Farmbelt Chemicals, Inc.
- "Incide-Out"[10]
- Nutra-Sol—Compounded for Thomas G. Kilfoil Co., Inc., San Bruno, CA
- Tank and Equipment Cleaner—Manufactured by Loveland Industries, Inc.
- Tank-Aid—Manufactured for Cornbelt Chemical Company

NOTES:

1. A steam cleaning of aerial spray tanks is recommended prior to performing the above cleanout procedure to facilitate the removal of any caked deposits.
2. When "Ally" is tank mixed with other pesticides, all cleanout procedures should be examined and the most rigorous procedure should be followed.
3. In addition to this cleanout procedure, all precleanout guidelines on subsequently applied products should be followed as per the individual labels.
4. Where routine spraying practices include shared equipment frequently being switched between applications of "Ally" and applications to sensitive crops during the same spray season, it is recommended a sprayer be dedicated to "Ally" to further reduce the chance of crop injury.

STORAGE AND DISPOSAL

STORAGE: Store product in original container only, away from other pesticides, fertilizer, food or feed.

PRODUCT DISPOSAL: Do not contaminate water, food or feed by storage, disposal or cleaning of equipment. Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility.

CONTAINER DISPOSAL: Triple-rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill or by incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

NOTICE TO BUYER: Purchase of this material does not confer any rights under patents of countries outside of the United States.

NOTICE OF WARRANTY

Du Pont warrants that this product conforms to the chemical description on the label thereof and is reasonably fit for purposes stated on such label only when used in accordance with directions under normal use conditions. It is impossible to eliminate all risks inherently associated with the use of this product. Crop injury, ineffectiveness, or other unintended consequences may result because of such factors as weather conditions, presence of other materials, or the manner of use or application, all of which are beyond the control of Du Pont. In no case shall Du Pont be liable for consequential, special or indirect damages resulting from the use or handling of this product. All such risks shall be assumed by the buyer. DU PONT MAKES NO WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE NOR ANY OTHER EXPRESS OR IMPLIED WARRANTY EXCEPT AS STATED ABOVE.

Registered trademarks of:

- [1] Sandoz Crop Protection Corporation.
- [2] Rhone-Poulenc Ag Company.
- [3] The Dow Chemical Company.
- [4] Ciba-Geigy Corporation.
- [5] American Cyanamid Company.
- [6] Hoechst-Roussel Agri-Vet Company.
- [7] Bayer AG, Leverkusen.
- [8] Delavan Corporation.
- [9] D. and W. Corporation.
- [10] Precision Laboratories, Inc.

AG-5384 9021 2/11/91

Material Safety Data Sheets



APPENDIX G

Noxious Weed Trust Fund

Programmatic Environmental Impact Statement

M A T E R I A L S A F E T Y D A T A S H E E T

DowElanco Indianapolis, IN 46268

Emergency Phone: 517-636-4400

Product Code: 87116

Page: 1

Product Name: TORDON (R) 22K WEED KILLER

Effective Date: 06/07/90 Date Printed: 05/17/91

MSDS:000380

1. INGREDIENTS: (% w/w, unless otherwise noted)

4-Amino-3,5,6-trichloropicolinic
acid, (picloram)

Potassium salt

CAS# 002545-60-0 24.4%

Inerts

75.6%

Water

CAS# 007732-18-5

Plus proprietary dispersing agents

This document is prepared pursuant to the OSHA Hazard Communication Standard (29 CFR 1910.1200). In addition, other substances not 'Hazardous' per this OSHA Standard may be listed. Where proprietary ingredient shows, the identity may be made available as provided in this standard.

2. PHYSICAL DATA:

BOILING POINT: IBP 212F, 100C

VAP. PRESS: Approx. 23 mmHg @ 20C

VAP. DENSITY: Not applic.

SOL. IN WATER: Infinite

SP. GRAVITY: 1.160 (68/68F, 20C)

APPEARANCE: Brown liquid.

ODOR: Not available.

3. FIRE AND EXPLOSION HAZARD DATA:

FLASH POINT: None observed up to 214F (TCC).

METHOD USED: TCC

FLAMMABLE LIMITS

LFL: Not determined

UFL: Not determined

EXTINGUISHING MEDIA: Alcohol foam, CO2, dry chemical.

FIRE & EXPLOSION HAZARDS: No autoignition temperature when tested to 1022F, 550C.

FIRE-FIGHTING EQUIPMENT: Positive-pressure, self-contained air supply. Avoid getting water from fire fighting into domestic or irrigation water supplies.

(Continued on page 2)

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Product Name: TORDON (R) 22K WEED KILLER

Effective Date: 06/07/90 Date Printed: 05/17/91

MSDS:000380

4. REACTIVITY DATA:

STABILITY: (CONDITIONS TO AVOID) Avoid sources of ignition if temperature is near or above flash point.

INCOMPATIBILITY: (SPECIFIC MATERIALS TO AVOID) None under normal use conditions. Under abnormal conditions avoid oxidizing materials and strong acids. Consult manufacturer for specific cases.

HAZARDOUS DECOMPOSITION PRODUCTS: Hydrogen chloride and nitrogen oxides under fire conditions.

HAZARDOUS POLYMERIZATION: Will not occur.

5. ENVIRONMENTAL AND DISPOSAL INFORMATION:

ACTION TO TAKE FOR SPILLS/LEAKS: Absorb in inert material such as sand or sawdust. In case of large spills, dike area to contain. Consult manufacturer for clean-up.

DISPOSAL METHOD: Bury in non-crop land away from water supplies or dispose of in a landfill approved for pesticides in accordance with applicable federal, state and local regulations.

6. HEALTH HAZARD DATA:

EYE: May cause severe eye irritation. Corneal injury is unlikely. Effects likely to heal readily.

SKIN CONTACT: Prolonged or repeated exposure may cause skin irritation, even a burn.

SKIN ABSORPTION: A single prolonged skin exposure is not likely to result in absorption of harmful amounts. The LD50 for skin absorption in rabbits is >2000 mg/kg.

INGESTION: Amounts ingested incidental to industrial handling are not likely to cause injury; however, ingestion of larger amounts may cause injury.

INHALATION: Single exposure to vapors is not likely to be hazardous.

SYSTEMIC & OTHER EFFECTS: Repeated excessive exposures to high

(Continued on page 3)

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Product Name: TORDON (R) 22K WEED KILLER

Effective Date: 06/07/90 Date Printed: 05/17/91

MSDS:000380

6. HEALTH HAZARD DATA: (CONTINUED)

amounts may cause liver effects. Did not cause cancer in long-term animal studies. Birth defects are unlikely. Even exposures having an adverse effect on the mother should have no effect on the fetus. The preponderance of data show picloram to be non-mutagenic in "in vitro" (test tube) tests and in test animals and is therefore believed to pose no mutagenic risk.

7. FIRST AID:

EYES: Irrigate with flowing water immediately and continuously for fifteen minutes. Consult medical personnel.

SKIN: Wash off in flowing water or shower.

INGESTION: Induce vomiting if large amounts are ingested. Consult medical personnel.

INHALATION: Remove to fresh air if effects occur. Consult medical.

NOTE TO PHYSICIAN: If burn is present, treat as any thermal burn, after decontamination. No specific antidote. Supportive care. Treatment based on judgment of the physician in response to reactions of the patient.

8. HANDLING PRECAUTIONS:

EXPOSURE GUIDELINE(S): ACGIH TLV for picloram is 10 mg/m³.

VENTILATION: Control airborne concentrations below the exposure guideline. Good general ventilation should be sufficient for most conditions.

RESPIRATORY PROTECTION: Atmospheric levels should be maintained below the exposure guideline. When respiratory protection is required for certain operations, use an approved air-purifying respirator.

SKIN PROTECTION: For brief contact, no precautions other than clean body-covering clothing should be needed. When prolonged or frequently repeated contact could occur, use protective clothing impervious to this material. Selection of specific items such as gloves, boots, apron or full-body suit will depend

(Continued on page 4)

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DowElanco Indianapolis, IN 46268

Emergency Phone: 517-636-4400

Product Code: 87116

Page: 4

Product Name: TORDON (R) 22K WEED KILLER

Effective Date: 06/07/90 Date Printed: 05/17/91

MSDS:000380

8. HANDLING PRECAUTIONS: (CONTINUED)

on operation.

EYE PROTECTION: Use chemical goggles.

9. ADDITIONAL INFORMATION:

SPECIAL PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: Keep out of reach of children. Avoid contact with skin and eyes. Provide eye fountain and washing facilities near work area. Do not ship or store with food, feeds, drugs or clothing. Do not contaminate irrigation or domestic water, food or feed by storage or disposal.

MSDS STATUS: Revised section 9 and regsheets.

For information regarding state/provincial and federal regulations see the Regulatory Information Section.

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M A T E R I A L S A F E T Y D A T A S H E E T

DowElanco Indianapolis, IN 46268

Emergency Phone: 517-636-4400

Product Code: 08103

Page: 1

Product Name: CURTAIL (R) HERBICIDE

Effective Date: 06/08/90 Date Printed: 05/17/91

MSDS:003053

1. INGREDIENTS: (% w/w, unless otherwise noted)

2,4-Dichlorophenoxyacetic acid (2,4-D), as alkanolamine salts of the ethanol and isopropanol series (proprietary mixture)	38.4%
3,6-Dichloro-2-pyridinecarboxylic acid (clopyralid), as alkanolamine salts of the ethanol and isopropanol series	7.5%
Other ingredients, total:	54.1%
Water	CAS# 007732-18-5
Proprietary sequestering agent and antifoamer	

This document is prepared pursuant to the OSHA Hazard Communication Standard (29 CFR 1910.1200). In addition, other substances not 'Hazardous' per this OSHA Standard may be listed. Where proprietary ingredient shows, the identity may be made available as provided in this standard.

2. PHYSICAL DATA:

BOILING POINT: 212F, 100C (water)
VAP. PRESS: Not determined
VAP. DENSITY: Not determined
SOL. IN WATER: Miscible
SP. GRAVITY: 1.154 (68/68)
FREEZING POINT: 10F
APPEARANCE: Dark amber liquid
ODOR: Phenolic

3. FIRE AND EXPLOSION HAZARD DATA:

FLASH POINT: >195F, 91C
METHOD USED: TCC

FLAMMABLE LIMITS
LFL: Not determined
UFL: Not determined

EXTINGUISHING MEDIA: Water fog, alcohol resistant foam, CO2, dry chemical.

FIRE AND EXPLOSION HAZARDS: Material is a water solution and

(Continued on page 2)

(R) Indicates a Trademark Of DowElanco

Product Code: 08103

Page: 2

Product Name: CURTAIL (R) HERBICIDE

Effective Date: 06/08/90 Date Printed: 05/17/91

MSDS:003053

3. FIRE AND EXPLOSION HAZARD DATA: (CONTINUED)

except under gross fire conditions should not burn. Avoid contaminating water supplies with run-off water.

FIRE-FIGHTING EQUIPMENT: Wear positive pressure, self-contained breathing apparatus and protective clothing.

4. REACTIVITY DATA:

STABILITY: (CONDITIONS TO AVOID) Store under cool, dry conditions. Avoid elevated temperatures and direct sunlight. Decomposes under fire conditions.

INCOMPATIBILITY: (SPECIFIC MATERIALS TO AVOID) Avoid acid, oxidizing material, halogenated organics, brass and copper.

HAZARDOUS DECOMPOSITION PRODUCTS: Hydrogen chloride, nitrogen oxides, chlorinated pyridine.

HAZARDOUS POLYMERIZATION: Will not occur.

5. ENVIRONMENTAL AND DISPOSAL INFORMATION:

ACTION TO TAKE FOR SPILLS: Absorb spills with materials such as sawdust or sand. Wash area with water. Do not allow wash water to contaminate water supplies.

DISPOSAL METHOD: If wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste representative at the nearest EPA Regional Office for guidance.

6. HEALTH HAZARD DATA:

EYE: May cause severe irritation with corneal injury which may result in permanent impairment of vision, even blindness.

SKIN CONTACT: Prolonged or repeated exposure may cause skin irritation. May cause more severe response if skin is abraded (scratched or cut).

SKIN ABSORPTION: A single prolonged exposure is not likely to result in the material being absorbed through skin in harmful amounts. The LD50 for skin absorption in rabbits is >4000

(Continued on page 3)

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Product Name: CURTAIL (R) HERBICIDE

Effective Date: 06/08/90 Date Printed: 05/17/91

MSDS:003053

6. HEALTH HAZARD DATA: (CONTINUED)

mg/kg.

INGESTION: Single dose oral toxicity is low. The oral LD50 for male rats is 3730 mg/kg and for females 2830 mg/kg. Amounts ingested incidental to industrial handling are not likely to cause injury; however, ingestion of larger amounts may cause injury. Ingestion may cause gastrointestinal irritation or ulceration.

INHALATION: Single exposure to vapors is not likely to be hazardous.

SYSTEMIC & OTHER EFFECTS: Excessive exposure may cause liver, kidney, gastrointestinal, and muscular, effects. Signs and symptoms of excessive exposure may be nausea and/or vomiting, abdominal cramps and/or diarrhea. Lethargy may be a sign or symptom of excessive exposure. Clopyralid did not cause cancer in longterm animal studies. Various animal cancer tests have shown no reliably positive association between 2,4-D exposure and cancer. Epidemiology studies on herbicide use (2,4-D) have been both positive and negative with the majority being negative. For clopyralid, birth defects are unlikely. Even exposures having an adverse effect on the mother should have no effect on the fetus. For 2,4-D, birth defects unlikely. Exposures having no effect on the mother should have no effect on the fetus. 2,4-D did not cause birth defects in animals; other effects were seen in the fetus only at doses which caused toxic effects to the mother. The chelating agent component has been reported to cause birth defects in laboratory animals only at exaggerated doses that were toxic to the mother. These effects are likely associated with zinc deficiency due to chelation. Exposures having no effect on the mother should have no effect on the fetus. In animal studies, clopyralid and the chelating agent have been shown not to interfere with reproduction. Excessive dietary levels of 2,4-D caused toxic effects (weight and viability reduction) in rats on a reproduction test. Results of in vitro ('test tube') mutagenicity tests have been negative for clopyralid. Results of mutagenicity tests on 2,4-D in animals have been inconclusive. 2,4-D has been shown to be negative in some in vitro ('test tube') mutagenicity tests and positive in others. For clopyralid, results of mutagenicity tests in animals have been negative.

(Continued on page 4)

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Product Name: CURTAIL (R) HERBICIDE

Effective Date: 06/08/90 Date Printed: 05/17/91

MSDS:003053

7. FIRST AID:

EYES: Immediate and continuous irrigation with flowing water for at least 15 minutes is imperative. Prompt medical consultation is essential.

SKIN: Wash off in flowing water or shower.

INGESTION: Induce vomiting immediately by giving two glasses of water and sticking finger down throat. Call a physician. Do not induce vomiting or give anything by mouth to an unconscious person.

INHALATION: Remove to fresh air if effects occur. Consult a physician.

NOTE TO PHYSICIAN: May cause tissue destruction leading to stricture. If lavage is performed, suggest endotracheal and/or esophagoscopy control. No specific antidote. Supportive care. Treatment based on judgment of the physician in response to reactions of the patient.

8. HANDLING PRECAUTIONS:

EXPOSURE GUIDELINE(S): Dow Industrial Hygiene Guide is 10 mg/m³ for clopyralid (3,6-dichloropyridine carboxylic acid). ACGIH TLV is 10 mg/m³ for 2,4-D acid. ACGIH TLV and OSHA PEL are 3 ppm for one of the proprietary components.

VENTILATION: Control airborne concentrations below the exposure guideline. Good general ventilation should be sufficient for most conditions.

RESPIRATORY PROTECTION: Atmospheric levels should be maintained below the exposure guideline. When respiratory protection is required for certain operations, use an approved air-purifying respirator.

SKIN PROTECTION: For brief contact, no precautions other than clean body-covering clothing should be needed. Use impervious gloves when prolonged or frequently repeated contact could occur.

EYE PROTECTION: Use chemical goggles. Eye wash fountain should be located in immediate work area.

(Continued on page 5)

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DowElanco Indianapolis, IN 46268

Emergency Phone: 517-636-4400

Product Code: 08103

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Product Name: CURTAIL (R) HERBICIDE

Effective Date: 06/08/90 Date Printed: 05/17/91

MSDS:003053

9. ADDITIONAL INFORMATION:

SPECIAL PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: See label. Keep out of reach of children. Do not get on skin, in eyes or on clothing. Do not swallow. Washing facilities near work area. Do not store near fertilizers, seed, fungicides or insecticides. Do not contaminate irrigation ditches or water used for domestic purposes.

MSDS STATUS: Revised section 9 and regsheets.

For information regarding state/provincial and federal regulations see the Regulatory Information Section.

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M A T E R I A L S A F E T Y D A T A S H E E T

Dow Chemical U.S.A.* Midland, MI 48674 Emergency Phone: 517-636-4400

Product Code: 08505
Product Name: STINGER (R) HERBICIDE

Page: 1

Effective Date: 02/22/90 Date Printed: 02/28/90 MSD: 002805

1. INGREDIENTS: (% w/w, unless otherwise noted)

Active Ingredient:	40.9%
Clopyralid (3,6-dichloro-2-pyridinecarboxylic acid), Monoethanolamine salt	
CAS# 057754-85-5	
Inert Ingredients:	59.1%
Water	
CAS# 007732-18-5	
Isopropyl alcohol	
CAS# 000067-63-0	
Proprietary surfactant	

This document is prepared pursuant to the OSHA Hazard Communication Standard (29 CFR 1910.1200). In addition, other substances not 'Hazardous' per this OSHA Standard may be listed. Where proprietary ingredient shows, the identity may be made available as provided in this standard.

2. PHYSICAL DATA:

BOILING POINT: 212F, 100C
VAP. PRESS: 23.5 mmHg @ 20C
VAP. DENSITY: 1.06 @ 20C
SOL. IN WATER: Infinite
SP. GRAVITY: 1.161 @ 68F, 20C
APPEARANCE: Dark brown clear liquid
ODOR: Sweet

3. FIRE AND EXPLOSION HAZARD DATA:

FLASH POINT: 117F, 47.2C
METHOD USED: TCC

FLAMMABLE LIMITS

LFL: Not deter.
UFL: Not deter.

EXTINGUISHING MEDIA: Water fog, alcohol resistant foam, CO2, dry chemical, foam preferred.

FIRE & EXPLOSION HAZARDS: Material is a water solution and except under gross fire conditions should not burn. Avoid

(Continued on Page 2)

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* An Operating Unit Of The Dow Chemical Company

M A T E R I A L S A F E T Y D A T A S H E E T

Dow Chemical U.S.A.* Midland, MI 48674 Emergency Phone: 317-636-4400

Product Code: 08505

Page: 2

Product Name: STINGER (R) HERBICIDE

Effective Date: 02/22/90

Date Printed: 02/28/90

MSD: 002805

3. FIRE AND EXPLOSION HAZARD DATA: (CONTINUED)

contaminating water supplies with run-off water.

FIRE-FIGHTING EQUIPMENT: Under fire conditions use a positive pressure self-contained breathing apparatus and protective clothing.

4. REACTIVITY DATA:

STABILITY: (CONDITIONS TO AVOID) Store under cool, dry conditions. Avoid elevated temperatures and direct sunlight. Combustible: prevent sources of ignition, especially if temperatures are near or at the flash point.

INCOMPATIBILITY: (SPECIFIC MATERIALS TO AVOID) Avoid acid, oxidizing material, halogenated organics, brass, copper, zinc, and aluminum.

HAZARDOUS DECOMPOSITION PRODUCTS: Hydrogen chloride, nitrogen oxides under fire conditions, chlorinated pyridine.

HAZARDOUS POLYMERIZATION: Will not occur.

5. ENVIRONMENTAL AND DISPOSAL INFORMATION:

ACTION TO TAKE FOR SPILLS/LEAKS: Absorb spills with inert materials such as sawdust or sand. Dike areas in case of large spills. Do not contaminate water supplies and irrigation ditches.

DISPOSAL METHOD: Bury waste material in approved dump (non-crop land) away from water supplies in accordance with applicable federal, state, and local regulations.

6. HEALTH HAZARD DATA:

EYE: May cause very slight transient (temporary) corneal injury.

SKIN CONTACT: Prolonged exposure may cause skin irritation. Repeated contact may cause drying or flaking of skin.

SKIN ABSORPTION: A single prolonged exposure is not likely to

(Continued on Page 3)

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M A T E R I A L S A F E T Y D A T A S H E E T

Dow Chemical U.S.A.* Midland, MI 48674 Emergency Phone: 517-636-4400

Product Code: 08505

Page: 3

Product Name: STINGER (R) HERBICIDE

Effective Date: 02/22/90 Date Printed: 02/28/90

MSD: 002805

6. HEALTH HAZARD DATA: (CONTINUED)

result in the material being absorbed through skin in harmful amounts. The LD50 for skin absorption in rabbits is >5000 mg/kg.

INGESTION: Single dose oral toxicity is low. The oral LD50 for both male and female rats is >5000 mg/kg. Small amounts swallowed incidental to normal handling operations are not likely to cause injury; swallowing amounts larger than that may cause injury.

INHALATION: Excessive vapor concentrations are attainable and could be hazardous on single exposure. The LC50 for rats is >3.0 mg/l. Excessive exposure to isopropanol, a minor component, may cause eye, nose, and throat irritation at around 400 ppm, and at prolonged (hours) and progressively higher levels, incoordination, confusion, hypotension, hypothermia, circulatory collapse, respiration arrest and even death.

SYSTEMIC (OTHER TARGET ORGAN) EFFECTS: Lethargy may be a sign or symptom of excessive exposure. Repeated excessive exposures to high amounts may cause liver and kidney effects. Observations in animals include middle ear lining damage upon exposure to vapors of isopropanol.

CANCER INFORMATION: Did not cause cancer in long-term animal studies.

TERATOLOGY (BIRTH DEFECTS): For the active ingredient, birth defects are unlikely. Even exposures having an adverse effect on the mother should have no effect on the fetus. At excessively high concentrations (17 times the TLV), isopropanol, a minor component, has been reported to cause birth defects in rats. At progressively lower concentrations there were no birth defects.

REPRODUCTIVE EFFECTS: In animal studies, has been shown not to interfere with reproduction.

MUTAGENICITY (EFFECTS ON GENETIC MATERIAL): Results of in-vitro ('test tube') mutagenicity tests on the active ingredient have

(Continued on Page 4)

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M A T E R I A L S A F E T Y D A T A S H E E T

Dow Chemical U.S.A.* Midland, MI 48674 Emergency Phone: 517-636-4400

Product Code: 08508

Page: 4

Product Name: STINGER (R) HERBICIDE

Effective Date: 02/22/90 Date Printed: 02/28/90

MSD: 002805

6. HEALTH HAZARD DATA: (CONTINUED)

been negative. Results of mutagenicity tests on the active ingredient in animals have been negative.

7. FIRST AID:

EYES: Irrigate with flowing water immediately and continuously for 15 minutes. Consult medical personnel.

SKIN: Wash off in flowing water or shower.

INGESTION: Induce vomiting if large amounts are ingested. Consult medical personnel.

INHALATION: Remove to fresh air. If not breathing, give mouth-to-mouth resuscitation. If breathing is difficult, give oxygen. Call a physician.

NOTE TO PHYSICIAN: No specific antidote. Supportive care. Treatment based on judgment of the physician in response to reactions of the patient.

8. HANDLING PRECAUTIONS:

EXPOSURE GUIDELINE(S): Dow Industrial Hygiene Guide is 10 mg/m³ for airborne 3,6-dichloro-2-pyridinecarboxylic acid. For isopropyl alcohol, the ACGIH TLV and OSHA PEL are 400 ppm TWA, 500 ppm STEL. An exposure guideline has been established for the proprietary component.

VENTILATION: Control airborne concentrations below the exposure guideline. Good general ventilation should be sufficient for most conditions. Local exhaust ventilation may be necessary for some operations.

RESPIRATORY PROTECTION: Atmospheric levels should be maintained below the exposure guidelines. When respiratory protection is required for certain operations, use an approved air-purifying respirator. If respiratory irritation is experienced, use an approved air-purifying respirator.

(Continued on Page 5)

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M A T E R I A L S A F E T Y D A T A S H E E T

Dow Chemical U.S.A.* Midland, MI 48674 Emergency Phone: 517-636-4400

Product Code: 08505
Product Name: STINGER (R) HERBICIDE

Page: 5

Effective Date: 02/22/90 Date Printed: 02/28/90

MSD: 002805

3. HANDLING PRECAUTIONS: (CONTINUED)

SKIN PROTECTION: For brief contact, no precautions other than clean body-covering clothing should be needed. Use impervious gloves when prolonged or frequently repeated contact could occur.

EYE PROTECTION: Use safety glasses.

3. ADDITIONAL INFORMATION:

REGULATORY REQUIREMENTS:

SARA HAZARD CATEGORY: This product has been reviewed according to the EPA 'Hazard Categories' promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

An immediate health hazard
A delayed health hazard
A fire hazard

SPECIAL PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: Keep out of reach of children and animals. Do not swallow. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling. Remove and wash contaminated clothing. Keep container closed. Do not ship or store with food, feed, drugs or clothing.

MSDS STATUS: Revised Section 6.

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An Operating Unit Of The Dow Chemical Company

MATERIAL SAFETY DATA SHEET

Wilbur-Ellis Company
Ag. Services Corporate Office
P.O. Box 16458
Fresno, CA 93755

Section 1 Name	Product / Trade Name 2,4-D Amine No. 4 Herbicide		Chemical Name / Common Name: 2,4-Dichlorophenoxy Acetic Acid/2,4-D		
	Emergency Telephone Numbers: Wilbur-Ellis Co. (209) 226-1934 Chemtrec (800) 424-9300				
Section 2 Hazardous Ingredients	2,4-D	46.88%	CAS # 2008-39-1	OSHA PEL 10 mg/m ³	ACGIH TLV 10 mg/m ³
Section 3 Physical Data	Flash Point / Method	>200°F	Melting Point	140°C *	
	Specific Gravity (H ₂ O = 1)	1.16	Vapor Pressure (mmHg)	0 @ 20°C *	
	Vapor Density (Air = 1)	NE	Solubility in H ₂ O	Soluble	
	% Volatiles by Vol.	NE	Odor/Appearance	Phenolic/Amber liquid	
Section 4 Fire & Explosion Hazard	Extinguishing Media <input checked="" type="checkbox"/> Water Fog <input checked="" type="checkbox"/> Foam <input checked="" type="checkbox"/> Alcohol Foam <input type="checkbox"/> CO ₂ <input checked="" type="checkbox"/> Dry Chemical <input type="checkbox"/> Other _____				
	Fire Fighting Precautions & Hazards: Fight fire upwind. Wear positive pressure, self-contained breathing apparatus, and full protective clothing. Vapors can readily form explosive mixtures in air. Dike area to prevent entering drains, sewers, or water courses. Evacuate people downwind from fire.				
Section 5 Carcinogen Status	<input type="checkbox"/> OSHA <input checked="" type="checkbox"/> NTP <input type="checkbox"/> IARC <input type="checkbox"/> No Listing Type				
Section 6 Reactivity	<input checked="" type="checkbox"/> Stable <input type="checkbox"/> Unstable		Hazardous Polymerization <input type="checkbox"/> May Occur <input checked="" type="checkbox"/> Will Not Occur		
	Avoid: Oxidizers Open burning Mineral acids		Hazardous Decomposition Products: Hydrogen Chloride (Acidic gas) Nitrogen Oxides		
Section 7 Spill or Leak Procedures	Steps to be taken in case of spill: Wear appropriate respiratory protective equipment. Absorb with inert material and place in approved disposal container.				
	Decontamination: Treat contaminated area with liquid household chlorine. Let stand 15 minutes and repeat procedure. Flush with water and absorb with inert material.				
	Environmental hazards: Dike area to prevent entry into drains, sewers, or water courses.				
	Disposal: Place in DOT-approved container and dispose of in an EPA Class I disposal site.				

*Technical Material

NE - Not Established

NA - Not Applicable

Section 8 Health Precaution Data	Ingestion: Acute oral LD ₅₀ (rats) 370 mg/kg (RTECS*). Do not ingest. Wash before eating, drinking, or smoking. Do not store near food or feed.
	Inhalation: PEL/TLV 10 mg/m ³ . Avoid inhalation of vapors or spray mist. Use appropriate respiratory protection.
	Skin absorption: Dermal LD ₅₀ (rats) 1500 mg/kg (RTECS*). Avoid skin contact. May cause skin irritation and burn. Wear appropriate personal protective equipment.
	Eye exposure: Keep out of eyes. May cause corneal injury. If exposed, flush eyes with water for 15 minutes.
	Effects of overexposure: May irritate mouth, throat, and gastrointestinal tract. Symptoms are: Chest pain, abdominal pain, diarrhea, muscle twitching, stiffness, sweating, and convulsions. Can be fatal. Chronic exposure may cause kidney, liver, blood, or testicular damage. Medical conditions involving the above symptoms may be aggravated by exposure.
Section 9 Special Protection Information	First aid: In all cases, get prompt medical attention. Induce vomiting. Do not induce vomiting if person is unconscious. Flush eyes for 15 minutes. If inhaled, remove to fresh air. For skin contact, remove contaminated clothing and shower with soap and water. Treat symptomatically.
	Respiratory protection: Use NIOSH/MSHA-approved respirator for pesticides for exposures up to 10 times the PEL/TLV. Positive pressure self-contained breathing apparatus should be used for confined space entry and exposures above 10 times the PEL/TLV.
	Personal protective equipment: Neoprene boots and gloves, long-sleeved coveralls, chemical goggles, and hat. For manufacture, formulation and application operations, recommend a shower at the end of the work shift.
Section 10 Special Precautions	Ventilation: Local exhaust ventilation recommended for manufacture and formulation. Store in a well-ventilated area. Allow closed trucks adequate time to ventilate prior to entering.
	Keep out of the reach of children.
	Read and follow all label instructions.
	Do not store near open flame, sparks, or other ignition sources.
	SARA hazard category (s) - acute and chronic

Prepared by:

THOMAS L. SLATTERLY, CSP

Date March 9, 1988

Notice: This information was developed from information on the constituent materials. No warranty is expressed or implied regarding the completeness or continuing accuracy of the information contained herein, and Wilbur-Ellis disclaims all liability for reliance thereon. The user should satisfy himself that he has all current data relevant to his particular use.

*Technical Material

MATERIAL SAFETY DATA SHEET

Wilbur-Ellis Company
Ag. Services Corporate Office
P.O. Box 16458
Fresno, CA 93755

Section 1 Name	Product / Trade Name MCPA Ester 4		Chemical Name / Common Name: Isooctyl Ester of 2 Methyl 4 Chloro- phenoxyacetic Acid/MCPA Ester	
	Emergency Telephone Numbers: Wilbur-Ellis Co. (209) 226-1934 Chemtrec (800) 424-9300			
Section 2 Hazardous Ingredients	CAS #		OSHA PEL	ACGIH TLV
	Isooctyl Ester of MCPA 69.7% 29450-45-4		NE	NE
Section 3 Physical Data	Flash Point / Method	128°F TCC	Melting Point	NA
	Specific Gravity (H ₂ O = 1)	1.008	Vapor Pressure (mmHg)	NE
	Vapor Density (Air = 1)	NE	Solubility in H ₂ O	Insoluble
	% Volatiles by Vol.	NE	Odor/Appearance	Phenolic/ Amber liquid
Section 4 Fire & Explosion Hazard	Extinguishing Media <input checked="" type="checkbox"/> Water Fog <input checked="" type="checkbox"/> Foam <input type="checkbox"/> Alcohol Foam <input checked="" type="checkbox"/> CO ₂ <input checked="" type="checkbox"/> Dry Chemical <input type="checkbox"/> Other _____			
	Fire Fighting Precautions & Hazards: Fight fire upwind. Wear positive pressure, self-contained breathing apparatus and full protective clothing. Vapors can readily form explosive mixtures with air. Dike area to prevent entering drains, sewers, or water courses. Evacuate people downwind from fire.			
Section 5 Carcinogen Status	<input type="checkbox"/> OSHA <input type="checkbox"/> NTP <input type="checkbox"/> IARC <input checked="" type="checkbox"/> No Listing Type			
Section 6 Reactivity	<input checked="" type="checkbox"/> Stable <input type="checkbox"/> Unstable	Hazardous Polymerization		<input type="checkbox"/> May Occur <input checked="" type="checkbox"/> Will Not Occur
	Avoid: Oxidizers, mineral acids, open burning		Hazardous Decomposition Products: Hydrogen chloride (acidic gas), nitrogen oxides	
Section 7 Spill or Leak Procedures	Steps to be taken in case of spill:			
	Wear appropriate respiratory protective equipment. Absorb with inert material and place in approved disposal container.			
	Decontamination:			
	Treat contaminated area with liquid household chlorine. Let stand 15 minutes and repeat procedure. Flush with water and absorb with inert materials.			
	Environmental hazards:			
	Dike area to prevent entering drains, sewers, or water courses.			
	Disposal:			
	Place in DOT-approved container and dispose of in an EPA Class I disposal site.			

*Technical Material

NE - Not Established

NA - Not Applicable

Section 8 Health Precaution Data	<p>Ingestion:</p> <p>Acute oral LD₅₀ (rats) 700 mg/kg (RTECS*). Do not ingest. Wash before eating, drinking, or smoking. Do not store near food or feed.</p> <p>Inhalation:</p> <p>No PEL/TLV established for this product. Avoid inhalation of vapors or spray mist. Use appropriate respiratory protection.</p> <p>Skin absorption:</p> <p>Dermal LD₅₀ (rats) 1500 mg/kg (RTECS*). Avoid skin contact. Wear appropriate personal protective equipment to reduce skin exposure.</p> <p>Eye exposure:</p> <p>Keep out of eyes. Can cause corneal injury. If exposed, flush with water for a minimum of 15 minutes.</p> <p>Effects of overexposure:</p> <p>May irritate mouth, throat, and gastrointestinal tract. Symptoms are: Chest pain, abdominal pain, diarrhea, muscle twitching, stiffness, sweating, and convulsions. Can be fatal. Chronic exposure may result in liver, kidney, blood, or testicular injury. Pre-existing conditions involving the above symptoms may be aggravated by exposure to this product.</p> <p>First aid:</p> <p>In all cases, get prompt medical attention. If ingested, give large amount of water and induce vomiting. Do not induce vomiting if person is unconscious. For eye contact, flush with water for a minimum of 15 minutes. For skin contact, remove contaminated clothing and shower with soap and water. If inhaled, remove to fresh air. Treat symptomatically.</p>
Section 9 Special Protection Information	<p>Respiratory protection:</p> <p>Recommend use of NIOSH/MSHA-approved respirator for pesticides for the exposure encountered. Positive pressure self-contained breathing apparatus should be used for confined space entry and high exposure operations.</p> <p>Personal protective equipment:</p> <p>Neoprene boots and gloves, chemical goggles, apron, hat, and long-sleeved coveralls. For manufacture, formulation, or application operations, recommend a shower at the end of the work shift.</p> <p>Ventilation:</p> <p>Local exhaust ventilation is recommended for manufacture or formulation. Store in a well-ventilated area. Allow closed trucks adequate time to ventilate prior to entering.</p>
Section 10 Special Precautions	<p>Do not store near food or feed.</p> <p>Keep out of the reach of children.</p> <p>Avoid prolonged or repeated breathing of vapors or mist.</p> <p>Follow all label instructions.</p> <p>SARA hazard category (s) - acute, chronic and flammable</p>

Prepared by:

THOMAS L. SLATTERLY, CSP

Date February 12, 1987

Notice: This information was developed from information on the constituent materials. No warranty is expressed or implied regarding the completeness or continuing accuracy of the information contained herein, and Wilbur-Ellis disclaims all liability for reliance thereon. The user should satisfy himself that he has all current data relevant to his particular use.

* Technical Material

MATERIAL SAFETY DATA SHEET

BANVEL® HERBICIDE

Product/Material: BANVEL® HERBICIDE

Manufacturer: SANDOZ CROP PROTECTION CORPORATION

Address: 341 East Ohio Street, Chicago, Illinois 60611

Emergency Phone: 312/670-4500

I. PRODUCT INFORMATION

Trade Name	BANVEL® HERBICIDE, BANVEL® 4S and BANVEL® 4WS
Synonyms	None known
Active Ingredient	Dimethylamine salt of dicamba
Chemical Family	Substituted benzoic acid
Chemical Formula	$C_8H_6Cl_2O_3 \cdot C_2H_7N$
CAS Registry Number	2300-66-5 (Active Ingredient)
DOT Hazard Class	Not regulated
EPA Reg. No.	55947-1
Regulatory Status	Regulated by EPA under FIFRA, Clean Water Act and CERCLA (Superfund).

II. HEALTH/SAFETY ALERT

WARNING HARMFUL IF SWALLOWED. AVOID CONTACT WITH SKIN, EYES AND CLOTHING.

III. FIRST AID PROCEDURES

Eye	Flush eyes with tap water for at least 15 minutes. Consult an ophthalmologist.
Skin	Wash with mild soap and water. Rinse with copious amounts of water. Launder clothing thoroughly before reuse.
Ingestion	Drink 1 or 2 glasses of water. Induce vomiting by touching back of throat with finger or blunt object. Do not induce vomiting or give anything by mouth to an unconscious person. Consult a physician.
Inhalation	Remove to fresh air. Apply artificial respiration if necessary. Consult a physician.

IN ALL CASES OF EMERGENCY CONTACT A PHYSICIAN.

IV. NOTE TO PHYSICIAN

Treatment is symptomatic. For ingestion, lavage stomach with tap water. Instill 30 gm activated charcoal in 3-4 oz. of water. Catharsis with 15 gm sodium sulfate in 6-8 oz. of water.

V. FIRE & EXPLOSION INFORMATION

NFPA Rating	Health: 1, Fire: 0, Reactivity: 0
Special Properties	None
Explosive Limits	Lower: Not applicable Upper: Not applicable
Flammability	Non-flammable
Flash Point	No flash point noticed up to 200°F
Extinguishing Media	Water spray, foam, dry chemical, CO ₂
Special Protective Equipment	In case of severe fire involving dicamba solution, protective clothing and self-contained breathing apparatus should be worn.
Special Fire Fighting Procedures	Use water to keep fire exposed containers cool. At first opportunity, remove from fire.
Products of Combustion	May yield steam, dicamba amine salt, HCl, organochloride products, oxides of nitrogen, carbon monoxide.
Unusual Fire and Explosion Hazards	Drums may burst as a result of steam being generated.

VI. SPILL CONTROL & CLEANUP

Steps to be taken	Contain spill and absorb with clay granules, sawdust or equivalent. Collect and place in suitable container for disposal. Area can be washed down with water and detergent to remove remaining herbicide. DO NOT ALLOW WASHINGS IN SEWER.
Absorbents	Clay granules, sawdust or dirt
Counteractants	Not applicable
Incompatibles	None known
Reportable Quantity	1000 lbs. of dicamba

VII. PRODUCT/WASTE DISPOSAL

Incinerate product/waste at a U.S. EPA permitted waste incinerator.

VIII. SPECIAL PRECAUTIONS

Storage Keep in an area suitable for pesticide storage. Store in cool, ventilated area away from seed, fertilizers, insecticides or fungicides. Keep away from children, wildlife, domestic animals, and pets.

IX. HEALTH HAZARD INFORMATION

Primary Route(s) of Entry Oral: No
Inhalation: Yes
Dermal/Eye: Yes

Carcinogen as determined by: NTP: No
IARC: No
OSHA: No

Signs and Symptoms of Acute Overexposure Nonspecific. Symptoms may include exhaustion, muscular spasms, urinary incontinence, dyspnea and cyanosis. Severe eye damage may occur. Skin irritation may occur.

Acute Toxicity: Oral The acute oral toxicity (LD_{50}) in rats has been reported to be 2629 mg/kg.

Dermal The acute dermal toxicity (LD_{50}) in rabbits has been reported to be ≥ 2000 mg/kg.

Inhalation The acute inhalation toxicity (LD_{50}) in rats has been reported to be >200 mg/liter (nominal concentration) for a 4-hour exposure.

Other Toxicological Information **Skin Irritation:** Mildly to moderately irritating to the skin of rabbits but not a primary skin irritant.

Eye Irritation: Extremely irritating and may be corrosive to the eyes of rabbits.

Other Repeated high levels of dermal exposure to rabbits has resulted in skin irritation and toxicity. The liver, kidney and lung appear to be the most sensitive organs affected from repeated oral, dermal, and inhalation exposures in experimental animals.

Dicamba, the active ingredient in BANVEL® HERBICIDE, has been studied extensively to determine potential health effects. Animal experimentation with dicamba has not demonstrated any carcinogenic, teratogenic or other reproductive effects with the exception of slightly reduced fetal body weights and post-implantation losses reported at the Maximum Tolerated Dose level. The preponderance of experimental data suggests dicamba is not a mutagen.

X. RECOMMENDED GENERAL PRECAUTIONS

Personal Protective Equipment Under normal conditions of use, respiratory protection is not required. In cases where inhalation is likely, a MSHA/NIOSH approved respirator for pesticides is recommended. In cases where eye and skin contact are likely, use of chemical safety goggles, impermeable gloves, and clean, body-covering clothing are recommended.

XI. PRODUCT INFORMATION—HAZARDOUS INGREDIENTS

Hazardous Ingredients (As defined by OSHA)	Component	WT%	TLV
	Dimethylamin salt of dicamba	48.2%	Not established
	Dimethylamine salt of related acids	12.0%	Not established
	Dimethylamine	17.0%	Not established
	Inert Ingredients	22.8%	10 ppm
		100.0%	
Exposure Limits	OSHA PEL: Not established ACGIH TLV: Not established NIOSH Limit: Not established		

XII. PHYSICAL AND CHEMICAL INFORMATION

Appearance and Odor	Amber solution, mild amine odor
Molecular Weight	Not applicable
Boiling Point	212°F
Melting Point	Not applicable
Vapor Pressure	18 mm Hg as water @ 68°
Vapor Density	>1.0 (Air = 1)
Specific Gravity	1.190 @ 21°C (H ₂ O = 1)
Solubility	Miscible in water
Evaporation Rate	Same as water
Stability	Stable
Reactivity	Not applicable
Decomposition Products	None

XIII. REGULATORY STATUS

Regulated by EPA under FIFRA, Clean Water Act, and CERCLA (Superfund).

The information presented herein, while not guaranteed, was prepared by technically knowledgeable personnel and to the best of our knowledge is true and accurate. It is not intended to be all inclusive and the manner and conditions of use and handling may involve other or additional considerations.

Information on this form is furnished solely for the purpose of compliance with the Occupational Safety and Health Act of 1970 and shall not be used for any other purpose. Use or dissemination of all or any part of this information for any other purpose or purposes is illegal.

MONSANTO PRODUCT NAME
ROUNDUP® Herbicide

MONSANTO COMPANY
800 N. LINDBERGH BLVD.
ST. LOUIS, MO 63167
Emergency Phone No. (Call Collect) 314-694-4000
DATE PREPARED: AUGUST, 1989

PRODUCT IDENTIFICATION

EPA Reg. No.: 524-308
Synonyms: None
Chemical Name: Not Applicable, Formulated Product
Active Ingredient: *Glyphosate, N-Phosphonomethylglycine, in the form of its isopropylamine salt..... 41.0%
Inert Ingredients: 59.0%
..... 100.0%
*Contains 480 grams per liter or 4 pounds per gallon of the active ingredient glyphosate in the form of its isopropylamine salt. Equivalent to 356 grams per liter or 3 pounds per U.S. gallon of the acid, glyphosate.

CAS Reg. No. : Not Applicable
CAS Reg. No. Active Ingredient: 1071-83-6
DOT Proper Shipping Name: Not Applicable
DOT Hazard Class/I.D. No.: Not Applicable
DOT Label: Not Applicable
Reportable Quantity (RQ)
Under U.S. CERCLA: Not Applicable
U.S. Surface Freight Classification: Weed Killing Compound, N.O.I.B.N.

SARA Hazard Notification

Hazard Categories Under Criteria of SARA

Title III Rules (40 CFR Part 370):

Immediate

Section 313 Toxic Chemical(s):

Not Applicable

Hazardous Chemical(s) Under OSHA Hazard Communication Standard:

This product contains, as components, the substances listed below which are identified as hazardous chemicals under the criteria of the OSHA Hazard Communication Standard (29 CFR 1910.1200):

Ethoxylated Tallowamines, CAS Reg. No. 61791-26-2

WARNING STATEMENTS

Keep out of reach of children

WARNING!

CAUSES EYE IRRITATION

HARMFUL IF SWALLOWED OR INHALED

MAY CAUSE SKIN IRRITATION

REFORMULATION IS PROHIBITED

SEE INDIVIDUAL CONTAINER LABEL FOR REPACKAGING LIMITATIONS.

PRECAUTIONARY MEASURES

Do not get in eyes, on skin or on clothing.

Wash thoroughly after handling. Avoid breathing vapor or spray mist.

Do not apply directly to water or wetland (swamps, bogs, marshes or potholes).

Do not contaminate water when disposing of equipment washwaters.

EMERGENCY AND FIRST AID PROCEDURES

FIRST AID:

- IF IN EYES:** Immediately flush with plenty of water for at least 15 minutes. Get medical attention.
- IF ON SKIN:** Immediately flush with plenty of water. Remove contaminated clothing. Wash clothing before reuse.
- IF SWALLOWED:** This product will produce gastrointestinal irritation. Immediately dilute by swallowing water or milk. Get medical attention.
- IF INHALED:** Remove individual to fresh air. Get medical attention if breathing difficulty develops.

NOTE: For additional human emergency first aid or treatment guidance call collect, anytime, day or night (314) 694-4000.

OCCUPATIONAL CONTROL PROCEDURES

- EYE PROTECTION:** Wear chemical splash goggles during mixing/pouring operations or other activities in which eye contact with undiluted ROUNDUP® herbicide is likely to occur.
- SKIN PROTECTION:** In cases in which prolonged or repeated skin contact with ROUNDUP herbicide may occur, long-sleeved shirt, long pants, and chemical protective (e.g. rubber) gloves are recommended. Wash hands and contaminated skin after handling. Clothing soaked with a solution of ROUNDUP herbicide should be promptly removed and laundered before reuse.
- RESPIRATORY PROTECTION:** Respiratory protection should not be required for normal use and handling. During periods of abnormal exposure to heavy spray or mist, use NIOSH/MSHA approved equipment for pesticide vapor/mist is recommended. The respirator use limitations specified by NIOSH/MSHA or the manufacturer must be observed.
- VENTILATION:** No special precautions are recommended.

AIRBORNE EXPOSURE LIMITS:

Product: ROUNDUP® Herbicide - 100% by wt.

OSHA PEL: None established

ACGIH TLV: None established

Ethoxylated Tallowamine

OSHA PEL: None established

ACGIH TLV: None established

FIRE PROTECTION INFORMATION

- Flash Point:** > 200°F Method: Tag Closed Cup
- Extinguishing Media:** Water spray, foam, dry chemical or CO₂, or any Class B extinguishing agent.
- Special Fire Fighting Procedures:** Fire fighters and others who may be exposed to vapors or products of combustion should wear a self-contained breathing apparatus and full protective clothing. Equipment should be thoroughly cleaned after use.
- Unusual Fire and Explosion Hazards:** None.

REACTIVITY DATA

- Stability:** Stable for at least 5 years under normal conditions of warehouse storage. Heated facilities are not required.
- Incompatibility:** Spray solutions of this product should be mixed, stored or applied only in stainless steel, aluminum, fiberglass, plastic and plastic-lined containers.
- DO NOT MIX, STORE OR APPLY THIS PRODUCT OR SPRAY SOLUTIONS OF THIS PRODUCT IN GALVANIZED OR UNLINED STEEL (EXCEPT STAINLESS STEEL) CONTAINERS OR SPRAY TANKS. This product or spray solutions of this product react with such containers and tanks to produce hydrogen gas which may form a highly combustible gas mixture. This gas mixture could flash or explode, causing serious personal injury, if ignited by open flame, spark, welder's torch, lighted cigarette or other ignition source.
- Hazardous Decomposition Products:** None.
- Hazardous Polymerization:** Does not occur. This product can react with caustic (basic) materials to liberate heat. This is not a polymerization but rather a chemical neutralization in an acid base reaction.

HEALTH EFFECTS SUMMARY

The following information summarizes human experience and results of scientific investigations reviewed by health professionals for hazard evaluation of ROUNDUP® herbicide and development of Precautionary Statements and Occupational Control Procedures recommended in this document.

EFFECTS OF EXPOSURE

Dermal contact and inhalation are expected to be the primary routes of occupational exposure to ROUNDUP herbicide. Direct contact with this material may cause temporary eye irritation and conjunctivitis. Prolonged contact with ROUNDUP may cause skin irritation. Ingestion of ROUNDUP has been reported to produce gastrointestinal discomfort with irritation of the mouth, nausea, vomiting and diarrhea. Oral ingestion of large quantities of concentrated product has been reported to result in hypotension and pulmonary edema.

TOXICOLOGICAL DATA

Data from laboratory studies conducted by Monsanto with ROUNDUP® herbicide are summarized below:

Single exposure (acute) studies indicate:

- Oral - Slightly Toxic (Rat LD₅₀ - 5,000 mg/kg)
- Oral - Practically Nontoxic (Mouse LD₅₀ - >5,000 mg/kg)
- Dermal - Practically Nontoxic (Rabbit LD₅₀ - >5,000 mg/kg)
- Inhalation - Slightly Toxic (Rat LC₅₀ - 3.18 mg/l)
- Eye Irritation - Moderately Irritating (Rabbit)
- Skin Irritation - Slightly Irritating (Rabbit, 4-hr exposure)
- DOT Skin Corrosion - Not Corrosive (Rabbit, 4-hr exposure)

No skin irritation, allergy or photoallergy was reported in human volunteers following repeated skin exposure; no skin irritation or photoirritation was reported with single skin exposure. No skin allergy was observed in guinea pigs following repeated skin exposure.

Following repeated skin exposure (3-week) to ROUNDUP® herbicide at 5 times the intended use concentration, severe skin irritation and systemic toxic effects (death, reduced food consumption, body weight loss and testicular effects) were observed in rabbits. Slight to moderate skin irritation was the only effect in rabbits treated with 3 times the intended use concentration. Systemic toxic effects at 5 times use concentration were considered to be a secondary response to the stress of severe skin irritation, to which rabbits are particularly sensitive, rather than the result of direct systemic toxicity. There was no evidence of cholinesterase inhibition in dogs (single oral doses). Minor nasal irritation was observed following repeated inhalation (4-weeks) of a 33% ROUNDUP herbicide solution by rats. When ROUNDUP herbicide was applied to skin of rhesus monkeys, an extremely low amount (1.8%) of the active ingredient was absorbed.

COMPONENTS

Data from laboratory studies conducted by Monsanto and from the scientific literature on components of ROUNDUP herbicide:

Isopropylamine Salt of Glyphosate

Data from studies with a formulation comprised of 62% isopropylamine salt of glyphosate (MON 0139) indicate the following:

MON 0139 was practically nontoxic orally (rats) or after skin application (rabbits). It was nonirritating to rabbit eyes and practically nonirritating to rabbit skin. In repeat dosing studies (6-month), dogs fed MON 0139 exhibited slight body weight changes. Following repeated skin exposure (3 week) to MON 0139, skin irritation was the primary effect in rabbits. Additional toxicity information is available on glyphosate, the active herbicidal ingredient of MON 0139, which has been tested in mutagenicity, teratogenicity, reproductive, acute, subchronic and chronic toxicity studies.

Surfactant

The surfactant component of ROUNDUP herbicide is reported to cause irritation to the eyes and skin and may contribute to the irritation potential reported for this herbicide. Ingestion may produce gastrointestinal irritation, nausea, vomiting and diarrhea.

PHYSICAL DATA

Appearance: Clear, viscous amber-colored solution.

pH: 4.4 - 4.9

Odor: Practically odorless to slight amine-like odor.

Specific Gravity (Water = 1): 1.17

NOTE: These physical data are typical values based on material tested but may vary from sample to sample. Typical values should not be construed as a guaranteed analysis of any specific lot or as specification items.

SPILL, LEAK & DISPOSAL INFORMATION

SPILL/LEAK:

Observe all protective and safety precautions when cleaning up spills -- See Occupational Control Procedures.

Liquid spills on floor or other impervious surfaces should be contained or diked, and should be absorbed with attapulgite, bentonite or other absorbent clays. Collect contaminated absorbent, place in plastic-lined metal drum and dispose of in accordance with instructions provided under DISPOSAL. Thoroughly scrub floor with a strong industrial type detergent solution and rinse with water.

Liquid spills that soak into the ground should be dug up, placed in plastic-lined metal drums and disposed of in accordance with instructions provided under DISPOSAL.

SPILL, LEAK & DISPOSAL INFORMATION (Continued)

Leaking containers should be separated from non-leakers and either the container or its contents transferred to a plastic-lined drum or other non-leaking container. Dispose of leaking container in accordance with instructions provided under DISPOSAL. Any recovered spilled liquid should be similarly collected and disposed of.

Do not contaminate water, foodstuffs, seed or feed by storage or disposal.

DISPOSAL:

Wastes resulting from the use of this product that cannot be used or chemically reprocessed should be disposed of in a landfill approved for pesticide disposal or in accordance with applicable Federal, state or local procedures.

Emptied container retains vapor and product residue. Observe all labeled safeguards until container is cleaned, reconditioned or destroyed. DO NOT CUT OR WELD ON OR NEAR THIS CONTAINER.

Metal Drums: Triple rinse container. Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or by other procedures approved by state and local authorities.

Plastic Jugs: Do not reuse container. Triple rinse container, then puncture and dispose of in a sanitary landfill, or by incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

Metal Bulk: Triple rinse emptied bulk containers. Then offer for recycling or reconditioning or disposal in a manner approved by state and local authorities.

Plastic Drums and Mini-Bulk: Do not reuse container. Return container per the Monsanto container return program. If not returned, triple rinse container, then puncture and dispose of in a sanitary landfill, or by incineration, or, if allowed, by state and local authorities, by burning. If burned, stay out of smoke.

ENVIRONMENTAL EFFECTS

ENVIRONMENTAL TOXICITY INFORMATION:

Oral LD ₅₀ Dog:	>5.0 ml/kg, Practically Nontoxic
Oral LD ₅₀ Goat:	4,860 mg/kg, Slightly Toxic
48-hr Oral LD ₅₀ Honeybee:	>100µg/bee
48-hr Dermal LD ₅₀ Honeybee:	>100µg/bee
48-hr EC ₅₀ <u>Daphnia magna (With Aeration):</u>	37 mg/l, Slightly Toxic
48-hr EC ₅₀ <u>Daphnia magna (Without Aeration):</u>	24 mg/l, Slightly Toxic
48-hr EC ₅₀ <u>Gammarus pseudolimnaeus:</u>	42 mg/l, Slightly Toxic
96-hr TL ₅₀ Carp:	19.7 ppm, Slightly Toxic
96-hr LC ₅₀ Bluegill sunfish (Static):	14 mg/l, Slightly Toxic
96-hr LC ₅₀ Bluegill sunfish (Flow-Through):	5.8 mg/l, Moderately Toxic
96-hr LC ₅₀ Rainbow trout (Static):	15-26 mg/l, Slightly Toxic
96-hr LC ₅₀ Rainbow trout (Flow-Through):	8.2 mg/l, Moderately Toxic
96-hr LC ₅₀ Channel catfish:	16 mg/l, Slightly Toxic
96-hr LC ₅₀ Fathead minnow:	9.4 mg/l, Moderately Toxic
96-hr LC ₅₀ Crayfish:	>1,000 ppm, Practically Nontoxic
96-hr LC ₅₀ Coho salmon:	22 mg/l, Slightly Toxic
96-hr LC ₅₀ Chinook salmon:	20 mg/l, Slightly Toxic

Carp contained in a static pond were unaffected at any time during a 90 day observation period following exposure by aerial application of ROUNDUP® herbicide at the normal use concentration. Tissue residue analyses indicated that glyphosate, the active ingredient in ROUNDUP herbicide will not bioaccumulate.

Exposure to ROUNDUP herbicide in freshwater at concentrations of 0, 10, 103 and 990 µg/l for 10 days did not impair the ability of salmon smolts to adapt to seawater.

Immersion of chicken eggs at four different embryo ages (0, 6, 12 and 18 days) for about five seconds in 1 or 5% vol/vol ROUNDUP herbicide in water solutions was reported to have no adverse effects on the hatchability or time to hatch of the eggs.

Brahman-cross heifers were given ROUNDUP herbicide, by gavage, at daily dosages of 0, 400, 500, 630 790 and 1000 mg/kg for 7 consecutive days. Clinical signs of toxicity, including loss of appetite, diarrhea and death (790 and 1000 mg/kg) were observed at 500 mg/kg or above. The no-effect level was considered to be 400 mg/kg/day.

DATE: August, 1989

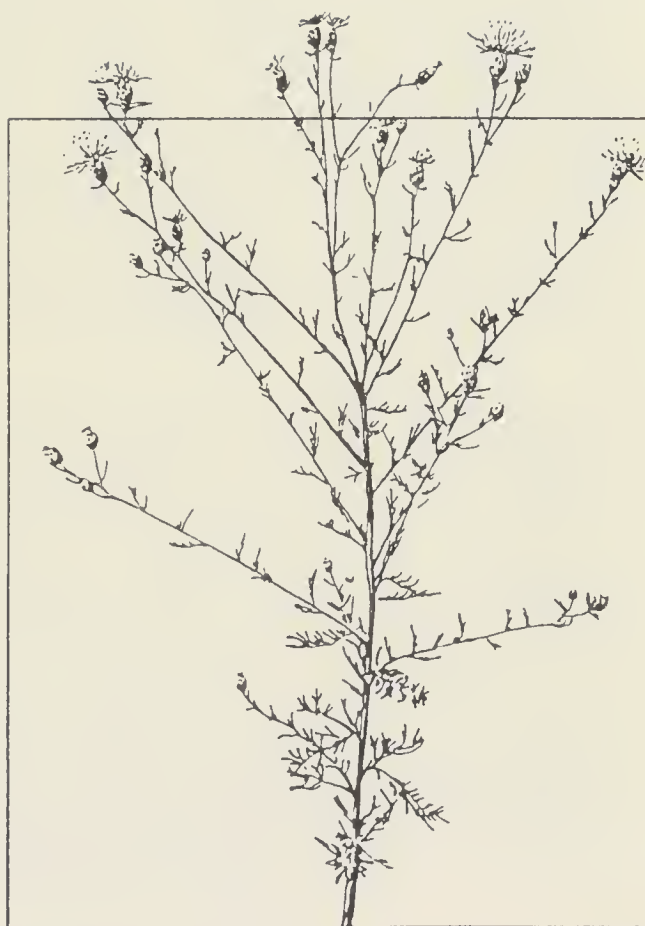
SUPERSEDES: November, 1985

MSDS NUMBER: M00007588

FOR ADDITIONAL NON-EMERGENCY INFORMATION, CALL : 314-694-4000

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Physical/Chemical Processes of Herbicides in Soil



APPENDIX H

Noxious Weed Trust Fund

Programmatic Environmental Impact Statement

APPENDIX H

PHYSICAL/CHEMICAL PROCESSES OF HERBICIDES IN SOIL

INTRODUCTION

The soil environment is comprised of a wide range of physical, biological, and chemical processes which affect the mobility and fate of herbicides applied to soil (Figure H-1). This appendix describes the primary soil processes and resultant effects on herbicides.

Adsorption / Desorption Soil adsorption is an important mechanism limiting the concentration and availability of herbicides for plant and microorganism uptake and decreasing the amount of herbicide leached deeper into the soil profile (CAST 1985). All herbicides applied to the soil are adsorbed to a certain extent. Adsorbed herbicides may exist in a passive state, unavailable to biological, physical, and chemical processes until desorption occurs (Anderson 1983). Colloidal particles consisting of clay minerals and organic matter are the most important soil components affecting adsorption of herbicides (Grover 1988). Herbicides are also adsorbed more strongly in acidic soils. The interaction of herbicides with pH, clay colloids, and organic matter varies from soil to soil.

Herbicides have been classified relative to their adsorption-desorption behavior. Most herbicides currently used are non-ionic and only slightly adsorbed by clay minerals, with the greater adsorption a result of reaction with metallic ions and organic matter. Because these herbicides are weakly adsorbed to clay colloids, they have a relatively high potential for leaching and downward movement. Adsorption of anions by soils is relatively weak, therefore herbicides forming anions in soils also have a relatively high potential for leaching and movement downward (Sparks 1989).

Photochemical Decomposition Exposure of herbicides to sunlight causes photochemical degradation which results in their deactivation.

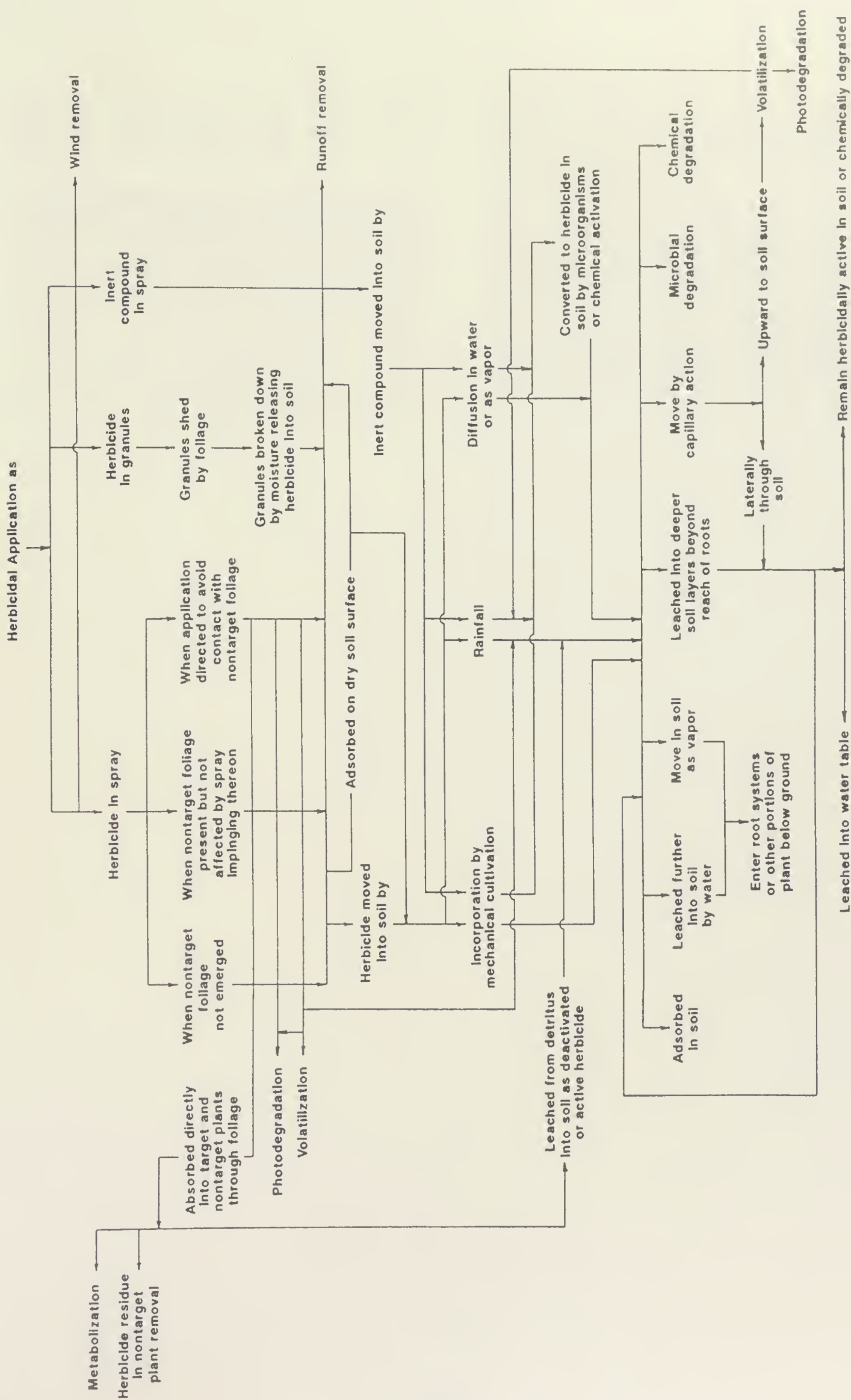
Photochemical decomposition is an important mechanism affecting deactivation and availability of herbicides (Anderson 1983).

Chemical Decomposition Chemical reactions in soils that deactivate herbicides are poorly understood; however, products of these reactions occur as the result of oxidation-reduction, hydrolysis, formation of water-insoluble salts, and formation of stable chemical complexes. These resultant compounds are usually reduced in herbicidal activity compared with the unreacted herbicide (Anderson 1983). A less common reaction can occur where a herbicidally active compound can form from an inactive one.

Physical Processes Physical processes affecting herbicide-soil interaction are leaching, volatility, and wind and water erosion (Anderson 1983). Soluble and insoluble herbicides can be leached in soils; however, water-soluble herbicides have the greatest potential for leaching (Anderson 1983; CAST 1985). Principal soil properties affecting leaching are texture, organic matter, and permeability. The volume of water flow through the soil, (precipitation and irrigation), herbicide adsorption, and solubility are also important factors.

Herbicide movement through wind and water erosion is largely dependent upon precipitation or irrigation, wind patterns, and soil characteristics. Usually, losses by erosion are less than 5% or 10% of the total herbicide applied (Grover 1988). The primary effects from erosion loss of herbicide are impacts to surface water and damage to adjacent non-target plants.

Herbicide losses to volatilization are high if herbicides are applied to moist soil and at high temperatures (Anderson 1983). Volatilization losses are minimal if the herbicide is incorporated into the soil. Volatilization rates from soil-incorporated herbicides are dependent on



convection and diffusion of chemicals to the soil surface, specific properties of the herbicide, and weather conditions (Grover 1988).

Microbial Decomposition Even though microbial decomposition includes chemical reactions, it is considered a separate process from chemical and physical herbicide-soil processes. Most microbial decomposition of herbicides takes place in the surface 12 inches of soil (Anderson 1983). Herbicides are deactivated in soils predominantly by biochemical processes carried out by microorganisms and, to a lesser degree, by plants (CAST 1985). The rate of deactivation by micro-

organisms depends on the chemical structure of the herbicide, presence of oxygen, temperature, moisture, pH, nutrients, plant cover, and prior use of other pesticides.

When microorganisms capable of decomposition of a specific herbicide are not present in the soil, microbial populations can mutate and develop the capability for decomposition. Once a herbicide has been applied and microorganisms are abundant and vigorous, the effectiveness of additional herbicide applications can be impaired by microbial decomposition (Anderson 1983).



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